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CONTENTS

DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

The New Silver Jubilee Record

AS we remark in an editorial article on page 360, and indeed as is apparent from our account of the L.N.E.R. Silver Jubilee journeys of August 27 on page 381, the maximum possibilities of that train have as yet been far from fully exploited. This is brought home forcibly by the uphill speed of *Silver Link* with the down train over precisely the same stretch as that on which, with the gradient in its favour, *Silver Fox* attained 113 m.p.h. If an average speed of 82·6 m.p.h. can be maintained up such a gradient as this with 270 tons of train, and if on surmounting the summit at 75 m.p.h. in no more than 18 per cent. cut-off, the boiler and steam-chest pressures are both practically equal, and both almost at the blowing-off point, it is clear that the limit of achievement has by no means been reached. On the down journey the aim was to see whether, with speed limited to a maximum of about 90 m.p.h., it was possible to secure any gain on schedule time, notwithstanding the addition of 15 per cent. to the normal load. Obviously this purpose could be attained only with the help of high speed uphill and extremely rapid recovery from all service slacks. The ability of *Silver Link* to meet all reasonable requirements was amply demonstrated by her performance last week.

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A Railway Rowland Hill

As recorded in our Scrap Heap columns this week the *Yorkshire Post* has been recalling the Charles Dickens comment that what the country needed was a railway Rowland Hill. Dickens made the proposal that excursionists, like letters, should be sent at a flat rate within an agreed area. Sixpence, he thought, would do within a 50-mile radius of London. In our issue of March 25, 1932, we published under the title "Penny Transport" the outline of an ingenious scheme of railway charges on the cheap flat-rate principle of penny postage. The author, Mr. Whately C. Arnold, introduced his scheme by pointing out that 90 per cent. of the population with incomes of less than £3 or £4 a week can seldom, if ever, afford to take a railway journey of more than about 30 miles when fares are a penny a mile, and he suggested five categories of passenger trains at charges so low as to attract a sufficiently increased number of passengers to make the railway service pay. "Penny trains" would stop at all stations; "sixpenny trains" would be non-stopping for five or six miles; "shilling trains" would have their stops about 30 miles apart; "half-crown trains" would be those that stopped at junctions with local lines, and "ten shilling trains" would be expresses non-stop for 100 miles or more. First class would cost the passenger three times as much. Goods traffic would be divided into five corresponding categories.

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The Week's Traffics

Traffics of the four group companies for the past week show a total increase of £61,000, compared with £154,000 for the previous week. For the year to date the gross earnings of the four companies together are estimated at £104,764,000, an increase of £3,119,000, or 3·07 per cent. Passenger train traffics of the L.M.S.R. for the 35 weeks show an increase of £256,000, or 1·46 per cent., of the L.N.E.R. £134,000, or 1·18 per cent., and of the Southern £104,000, or 0·96 per cent. On the L.M.S.R. the increase in merchandise is £924,000, or 5·97 per cent. on the L.N.E.R. £413,000, or 3·85 per cent., and on the Great Western £270,000, or 4·31 per cent.

	35th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 2,000	+ 12,000	+ 12,000	+ 26,000	+ 1,607,000	+ 3·94
L.N.E.R. ..	+ 6,000	+ 2,000	+ 8,000	+ 16,000	+ 950,000	+ 3·19
G.W.R. ..	+ 8,000	+ 4,000	+ 2,000	+ 14,000	+ 391,000	+ 2·29
S.R. ..	+ 13,000	− 2,500	− 5,500	+ 5,000	+ 17,000	+ 1·22

The Belfast & County Down has to date an increase of £1,651, the Great Northern (Ireland) one of £21,450, and the Great Southern one of £118,881.

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Atchison, Topeka & Santa Fe Railway

Since its reorganisation in 1895 the Atchison, Topeka & Santa Fe Railway Company has regularly paid dividends on its common stock except for the year 1933. From 1927 to 1931 it paid 10 per cent. For the last two years the rate has been 2 per cent. Passenger revenues increased in 1935 by 12·33 per cent. in comparison with 1934, partly because of improved business conditions and partly because of the provision of air-conditioned equipment. During the current year 15 Pullman standard sleeping cars, 15 Pullman tourist sleeping cars, and 48 day

coaches are being provided with this equipment so that all important trains may enjoy this facility. Some financial results for the past two years are compared herewith:—

	1935	1934
	$	$
Freight revenues	109,685,779	104,720,630
Passenger revenues	13,447,074	11,970,642
Total operating revenues	135,686,392	128,093,948
Total operating expenses	109,423,484	102,083,479
Net operating revenues	26,262,908	26,010,468
Net corporate income available for dividends and surplus	9,554,315	7,001,314

Appropriations aggregating $2,200,000 were made for 1935 and 1936 to continue the general policy of reducing curvature along the transcontinental main line. The operating ratio has risen from 79·69 per cent. in 1934 to 80·64 per cent. in 1935.

* * * *

Hungarian Railways in 1934-35

Results of working the Royal Hungarian State Railways for the year 1934-35, as shown by the report we have received, indicate a set-back in comparison with the previous year. A drop in freight traffic receipts and an increase in interest charges are the main causes of the difference. At the present official rate of exchange £1 = 16⅞ pengös.

	1934-35	1933-34
Kilometres open	7,820	7,820
Passengers	60,392,988	58,256,381
Revenue freight tons	14,774,141	15,184,337
„ „ ton-km.	1,995,166,782	2,061,478,250
Revenue train-km.	38,794,706	39,160,495
	Pengös	Pengös
Passenger receipts	62,580,389	64,470,485
Freight traffic receipts	122,033,014	130,754,333
Gross receipts	197,250,020	209,097,420
Operating expenses	233,778,662	237,958,635
Interest charges, &c.	27,328,898	25,846,438
Total deficit	63,857,540	54,707,653

Of the kilometres operated 238 are electric and 111 are used for goods traffic only. Railcars are employed on 1,805 km. of main line and 2,400 km. of branch lines.

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The First Escalator

Recent correspondence in the columns of the *Sunday Times* discussed the question of the first moving stairway in England, and, from the railway aspect, left the matter at an unsatisfactory point. There is very little doubt that the earliest example in this country was the once-famous "sliding staircase" erected in the centre transept of the Crystal Palace in 1899. Visitors passed through a turnstile and paid 1d. for the privilege of riding up and then walking down, and the feat was commemorated in W. P. Dempsey's music-hall song "Up the Sliding Stairs." What is not so generally realised is that a British railway adopted the same device—the Reno inclined elevator—shortly afterwards, but a perusal of the columns of our constituent paper *Transport* for the first half of 1901 makes the matter clear. In the issue of February 8, 1901, we recorded that the Liverpool Overhead Railway had opened the installation at Seaforth station for public use, and on the following March 15 we illustrated and described it. In essence it was an inclined moving platform and not a series of steps, but otherwise was very similar to a modern escalator, for the longitudinal rubber-covered ridges of the tread passed between the prongs of a comb-shaped landing, and a moving handrail was synchronised with the platform. A 10-h.p. motor drove the "inclined elevator" at 100 ft. a minute. Similar elevators had already proved their value in the U.S.A. during the closing years of the nineteenth century on the Manhattan elevated railway, New York.

Train Services in 1914 and 1936

It is often contended that tables showing the fastest train times operative between any two cities are of limited value; for the truest measure of the facilities offered to the public is a combination of frequency and average speed of a train service as a whole. There is a good deal to be said for this contention, though at the same time the value of such ultra high speed services as the Silver Jubilee of the L.N.E.R. and the Bristolian of the G.W.R. is not to be overlooked, for they offer to the business man facilities which, but for their exceptional speed, would be beyond his reach. A table appearing on page 367 of this issue, however, gives an interesting survey, not only of the comparative frequency and average speed of some of the most important long distance train services in Great Britain in 1936, but also the developments that have taken place since 1914, the basic year of pre-war comparison. The principal value of this table is the proof it affords that British train services have been speeded up as a whole in a degree that at least equals, and in some cases surpasses, the acceleration of their fastest trains. Nevertheless there are some "black spots" among the figures; for example, the London-Sheffield passenger is no better off now than in 1914, and if frequency as well as speed be taken into account, the London-Birmingham passenger is definitely worse off.

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An American Exhibition Train

On another page in this week's issue we describe and illustrate the Rexall streamlined train, a "million dollar" American development of the exhibition trains that have enjoyed increasing popularity on the British railways since the introduction of the Fry's show train early in the summer of 1933. Since March of this year this ambitious advertisement, sponsored by the United Drug Company, has been making an extensive tour of the North American Continent. As originally conceived the Rexall train was not intended for public inspection; rather was it chartered to enable the executives of the United Drug Company to make direct contact with some 10,000 branches and agencies which, scattered through the United States and Canada, sell products bearing the Rexall trade mark. General interest, however, was so quickly aroused by the advent of the train that it was decided to admit also the general public. When the train arrived at Montreal on August 18, 1,100,000 had already visited it, and at Los Angeles there had been a record attendance of 37,000 in two days. Altogether some 200 centres are to be visited before the train concludes its lengthy tour of 29,000 miles. It would seem almost certain that the success of this Rexall venture will encourage others engaged in trading in comparatively sparsely populated areas to adopt similar methods of sales promotion.

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Sleeping Car Pioneers

Though Sweden was not the first country to introduce sleeping cars for all classes of passenger, the Swedish State Railways may well claim to be among the earliest pioneers of third class comfort of this kind. In 1910, eighteen years before such vehicles were introduced on British railways, a service of third class sleepers was inaugurated on the Stockholm-Gothenburg line, 284 miles in length. Owing to the generous Swedish loading gauge, it was feasible to range three third class berths one above the other without undue cramping of the passengers, though it is not possible for the passenger to sit upright on his berth once the bed has been made up. In recent years, improvements have been effected in the design of the stan-

dard Swedish sleeper. The three-berth arrangement still prevails, but the modern third class sleeping compartments are single-sided, instead of containing two tiers of three berths each. For second class passengers two-berth compartments are provided, and first class passengers have the exclusive use of such compartments; bedding is provided for all three classes. The standard Swedish sleeping car of today, as used on the State Railways, is 77 ft. 1 in. overall and approximately 10 ft. 3½ in. wide, with a height of a little over 13 ft. 4 in. Apart from ferry-boat mileage, as between Trälleborg and Sassnitz, a total of 1,825 miles of route is covered by the sleeper services of the Swedish State Railways. In addition, sleeping cars are run by the Bergslagernas Railway Company on the night trains between Gothenburg and Falun. The sleeping car supplement in Sweden is 20 Kr., 10 Kr., and 5 Kr., a night, according to class, irrespective of distance, and experience has taught us that the accommodation is most comfortable.

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The "Oversea" Railway to Key West

Almost exactly a year ago, on September 2, 1935, to be precise, a hurricane of tropical violence wrought so much destruction on the 105-mile Key West extension of the Florida East Coast Railroad, that the train service beyond Florida City, 30 miles south of Miami, has never been resumed. We recorded the occurrence at the time and the article on page 369 entitled "Railway Bridge Welding in America" brings us back to it, for it was on this Key West extension that the first all-welded railway underbridge in America was to be found. Whether it survived the hurricane or not we do not know, but its historic interest remains. It has been estimated that fully to restore the Key West extension would cost something like $3,000,000, a sum which, for the service rendered, would not appear to be justified, as much of the passenger traffic to Cuba that formerly transferred from rail to sea at Key West now goes by air, and freight traffic is served from Port Everglades, a new port a few miles from Miami, whence the wagon ferry to Havana plies. Although it takes about 12 hours longer than between Havana and Key West, better schedules have been arranged from the mainland. Users are therefore unlikely to offer opposition to the application made last month by the railway company's receivers to the Interstate Commerce Commission for authority to abandon the 125 miles between Florida City and Key West.

* * * *

Railways and Radio

In countries of great distances it is essential that the largest railway centres should be in the closest possible communication with one another. The Indian railways are well to the fore-front in this important matter, as Delhi is directly connected with Calcutta, Bombay, and Lahore by radio. The roof of the headquarters offices of the North Western Railway in the latter city is surmounted by 95-ft. aerial masts, which are illustrated in the August issue of the *North Western Railway Magazine*. The installation is stated to have proved a great asset for efficient and direct working between the above named important stations, and, as office hours are synchronised, and the installation is in the administrative offices, a great saving of time has resulted. Another valuable use for radio is in the preliminary survey of a large area for a new line of railway, where mobile survey parties are scattered about examining alternative routes, or strung out along an alignment. Quite inexpensive portable sets are obtainable with a range up to about 10 miles, which would generally be effective in such cases. On construction works also, radio might in some cases be useful, though the running out of a telegraph or telephone wire is usually one of the first measures taken when a construction is sanctioned, so as to link up divisional and subdivisional headquarters, and important bridges with headquarters.

* * * *

Are Large Rolling-Stock Programmes Justified?

A correspondent writing under the *nom-de-plume* "Stockholder" to the *Financial Times* asks whether the expenditure on improvements and rolling-stock additions on which group companies have embarked is either necessary or desirable. Large orders for freight wagons have been placed by the L.M.S. and L.N.E. Railways to meet 1937 requirements, and "Stockholder" remarks that these cannot all be necessary replacements of existing stock. The fact that they are not by no means implies that the shareholders' interests are being neglected, for the growth in freight traffic during the last two or three years, coupled with the earlier reduced building programmes, have necessitated large orders being placed for wagons urgently required to handle the growing traffic, particularly in the heavy iron and steel industries. These urgent demands, especially felt last year, as the tide of trade was turning, must be met if trade is to be helped and customers kept. In addition, it must be remembered that when drastic economy was the most pressing rule, new wagon building programmes were kept small and old wagons retained in service as long as they were usable, though they might not be best suited to modern requirements. The present trade improvement, therefore, gives a favourable opportunity for their replacement.

* * * *

Locomotive Safety Valves

One of the subjects discussed at the fifteenth annual meeting of the Mechanical Division of the Association of American Railroads, held at Chicago in June last, was that of the design and operation of safety valves for locomotive boilers. The committee of locomotive construction reported that safety valve requirements in locomotive service differed from those in stationary practice in that the rates of draught and combustion under maximum working conditions are directly proportional to the steam consumption of the cylinders, whereas in stationary service the draught is generally produced independently of steam consumption and there is no automatic relation between the consumption and the rate of combustion. In a locomotive boiler therefore, it is necessary only to provide sufficient safety valve capacity to discharge the steam which can be generated over and above the output to cylinders and auxiliaries. Conditions under which the amount of steam to be handled by the safety valves of the locomotive becomes greatest seem to be realised in a coal-burning locomotive when the engine is stopped suddenly after running for a considerable period under conditions which require the maximum rate of combustion. In these circumstances the radiant heat from the fire maintains for a short period a rate of evaporation that may, and probably does, approximate to the evaporation attained under working conditions; hence the need for special consideration, and possibly tests, to determine the correct safety valve capacity for a boiler having an unusually large grate area. In an oil-burning locomotive under the same conditions the maximum steam generation to be considered in determining safety valve capacity is that which can be maintained when the fire is forced by the blower with steam from an outside source and all steam outlets from the boiler are closed.

The Appeal of Speed

DURING the last few days, British enterprise on rail and sea has been exemplified by the notable run of the L.N.E.R. Silver Jubilee train with a maximum of 113 m.p.h., and by the completion of the *Queen Mary's* record-breaking Atlantic crossing, and popular interest in speed has been adequately shown by the space in the lay press devoted to these exploits. Even in Old Testament days high speed was deemed worthy of note, for we learn (II Kings, ch. 9, v. 20) that "the driving is like the driving of Jehu the son of Nimshi; for he driveth furiously." Incidentally, the Rev. Walter Crick of Eastbourne, writing in *The Times* on Monday, points out that Charles Greville appreciated the rapid transport (compared with coach travel) afforded by the Grand Junction Railway nearly 100 years ago. Writing in his diary on July 18, 1837, Greville says:—

> I started at 5 o'clock on Sunday evening; got to Birmingham at half-past 5 on Monday morning, and got upon the railroad at half-past 7. Nothing could be more comfortable than the vehicle in which I was put, a sort of chariot with two places; and there is nothing disagreeable about it but the occasional whiffs of stinking air, which it is impossible to exclude altogether. The first sensation is a slight degree of nervousness, but a sense of security soon supervenes, and the velocity is delightful. Town after town, one park and château after another, are left behind with the rapid variety of a moving panorama, and the continual bustle and animation of the changes and stoppages make the journey very entertaining. The train was very long and heads were continually popping out of the several carriages, attracted by well-known voices; and then came the greetings and exclamations of surprise, the "Where are you going?" and "How on earth came you here?" It certainly renders all other travelling irksome and tedious by comparison.

The Grand Junction—the first British trunk railway to be opened—had then been in service only a fortnight. It should be pointed out that Greville was travelling on an ordinary train, the real object of all acceleration, for, as Sir Percy Bates of the Cunard White Star Line said of the *Queen Mary's* record, regularity of fast transport is the desideratum rather than a special spectacular run.

It was on an ordinary train, too, that an L.N.E.R. locomotive reached on rails the unprecedented speed, for Great Britain, of 113 m.p.h. The science of propulsion by steam is thus shown to be still very much alive. Indeed, it is doubtful if ever previously an ordinary passenger train, with steam propulsion, has travelled at 110 m.p.h. for 7½ miles continuously. The German maximum of 118 m.p.h., described in our issue of June 12, was with a special train, and, moreover, of three cars only, weighing 142 tons, as compared with the eight cars, weighing 270 tons, hauled by *Silver Fox*, even though the latter had a down gradient in its favour. From the point of view of locomotive performance, however, the uphill achievements of *Silver Link* with the down Silver Jubilee on the same day were even more notable, and indicate that, after being twice in the public eye as British record breakers, Sir Nigel Gresley's streamlined Pacifics have still not shown their full powers. We comment upon these performances on page 357, and describe the up and down journeys on page 381.

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Southern Pacific Company

THE Southern Pacific with its subsidiaries and by control through stock ownership forms a transcontinental system extending from New Orleans, with branches to Gulf ports, to Houston (Texas), Los Angeles and San Francisco in California, and Portland (Oregon), with a line extending from Ogden (Utah) to San Francisco. Associated with the system are the Pacific Greyhound Corporation and the Southwestern Greyhound Lines Inc. The first-mentioned, and its solely controlled subsidiaries, operate the principal motorbus lines on the Pacific Coast south of Portland, Oregon, and in the territory west of Salt Lake City (Utah), Albuquerque (New Mexico), and El Paso (Texas). Its motor coaches in 1935 worked over an average of 8,251 route miles. Operations of Southwestern Greyhound Lines, in the territory between Albuquerque and El Paso on the west, and St. Louis, Missouri, and Memphis, Tennessee, on the east, extended over an average of 5,323 route miles during 1935. The Southern Pacific also has a controlling interest in the Southern Pacific Golden Gate Company, a holding company which controls Southern Pacific Golden Gate Ferries Limited, an undertaking which operates vehicle ferries on San Francisco Bay.

From the report of the Southern Pacific Company for the year 1935 it appears that there was a marked improvement in business conditions generally in the territory served by the company's lines, mainly due to increased industrial and construction activity. Passenger revenues increased $2,045,095, or 10·92 per cent. This substantial increase, while due primarily to the improvement in business conditions, also reflects the stimulation of travel resulting from the operation of air-conditioned passenger cars and continuance of the low basis of fares experimentally initiated in 1933. Freight revenues also showed a large advance, and there were also increases in the earnings from traffic carried for the Pacific Motor Transport Company, and for the affiliated motor transport companies operating in Texas and Louisiana; and from Pullman cars and milk traffic, and from dining and buffet cars and restaurants. The accompanying income account covers the Southern Pacific Lines (Southern Pacific Company and Transportation System Companies, consolidated, excluding off-setting accounts and inter-company dividends):—

	1935	1934
	$	$
Railway operating revenues	163,381,512	149,192,709
Railway operating expenses	123,898,159	113,579,216
Net revenue from railway operations	39,483,353	35,613,493
Net railway operating income ..	20,319,880	17,003,658
Total income	34,500,869	33,233,920
Income available for fixed charges ..	32,925,132	31,413,901
Fixed charges	30,578,542	31,005,676
Net income	2,346,590	408,225

From net income in 1935 the sum of $945,722 was applied to sinking and other reserve funds, leaving $1,400,868 to be transferred to credit of profit and loss. Approximately $5,600,000 of the $10,318,943 increase in operating expenses resulted from the action taken, in common with other railroads, in restoring the 10 per cent. reduction in employees' wages made effective early in 1932; one fourth thereof having been restored on July 1, 1934, one fourth on January 1, 1935, and the final one half on April 1, 1935. Other increases in operating expenses were due, principally, to the larger forces and increased train service required to handle the heavier volume of traffic, to the higher prices for fuel, and to the conditioning of more freight and passenger cars. During the year the company installed air-conditioning equipment in 95 passenger cars of its own ownership, making a total of 138 owned cars equipped for air-conditioning as at December 31, 1935. The Pullman Company equipped with air-conditioning plant an additional 179 cars of its ownership in service on Southern Pacific Lines, making a total, as at December 31, 1935, of 201 air-conditioned Pullman cars of various types, for which the railway company pays rental. The programme for 1936 provides for the installation by the railway company of air-conditioned equipment in 118 of its cars, and by the Pullman Company in 104 cars of its ownership in service on Southern Pacific Lines.

Commutation of Empty Haulage Charges

THE scheme for the commutation of empty haulage charges on privately owned railway wagons has now been in operation three years with satisfactory results both to railway companies and private owners of railway rolling stock. In July, 1931, a serious difference of opinion arose between the Association of Private Owners of Railway Rolling Stock and the railway companies regarding the interpretation of the railway rolling stock regulations which came into force on the "appointed day," January 1, 1928. These regulations provide, *inter alia*, that if a privately owned empty wagon travels in any direction over the lines of the same companies as on the loaded journeys, free haulage will be given by each company for a distance not exceeding that travelled on the outward journey, subject to certain conditions. The railway companies took the view that under these regulations the immunity from empty haulage charges attached not to the wagon, but to the trader on whose behalf the equivalent loaded journey was performed, and from whom the consideration for such empty haulage was received by the railway company.

The association, and other representative bodies, contended that this interpretation was incorrect, and that the right to an equivalent empty journey attached to the wagon itself without any restriction of that benefit to the person on whose behalf it was performed. Efforts to resolve the difference of opinion failed, and the matter was brought before the Railway Rates Tribunal for settlement. After this hearing had proceeded for two days it became evident that it would be in the best interests of all parties if a settlement could be reached on an amicable basis. The hearing was adjourned accordingly and, after protracted negotiations, a scheme was evolved for the commutation of the empty haulage charges by a fixed annual payment per wagon, as by this means substantial clerical work would be saved, future possibilities of disputes would be avoided, and a constant source of friction removed. Briefly stated, the scheme provided that the four main-line railway companies should accept an aggregate sum of £21,000 per annum in commutation of all their charges in connection with the movement of privately owned wagons, subject to certain well-defined exceptions for special reasons. This sum related to about 526,000 wagons, and it was finally agreed that each class of privately owned wagon should bear a specified charge per annum, making in the aggregate the sum in question.

The sums payable ranged from 1d. a wagon a year in the case of colliery owned, coal merchants and factors, co-operative societies, public utility undertakings, &c., to 6d. a wagon a year for wagons carrying stone, gravel, brick, lime, cement, &c., and 1s. 10d. a wagon a year for wagons owned by wagon-letting companies. So far as wagons under repair contracts included in the above categories are concerned, it was agreed that 11d. a wagon a year should be paid by the repairing company concerned. The proposals met with a cordial welcome from private wagon owners, and traders owning over 83 per cent. of the total stock of privately owned wagons in England and Wales assented to them, with the result that the railway companies brought the scheme into operation on July 1, 1933, on the understanding that, as far as practicable, the empty haulage of privately owned wagons would be kept within the limits of the services performed under the conditions which existed prior to that date, in order to ensure that wagons should be run with the least possible amount of empty haulage. The operation of the scheme has fully realised anticipations and, in order that the wagons embraced by the arrangement can readily be identified, arrangements have been made with the wagon owners for them to be painted or plated on both sides immediately above the wagon number with a five-pointed yellow star, six in. in dia.

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Railway Employment

THE great volume of employment provided by the railway companies of Great Britain is once more demonstrated by the figures appearing in the annual return of railway staff (dated August 25, 1936) which the Ministry of Transport issued last week-end. This year the census was taken during the week ended March 7 and comparisons are made with the week ended March 9, 1935. An increase of one per cent. (4,845 employees) is again recorded, bringing the total staff to 585,611, which is the highest number since 1932. Actually, the increase on the four main-line companies is 5,060; the numbers employed by the Cheshire Lines Committee, the London Passenger Transport Board, the Midland & Great Northern Joint Line, and the Railway Clearing House are somewhat smaller than in 1935. The L.M.S.R. employs by far the greatest number (222,869), the L.N.E.R. some fifty-one thousand fewer (171,798), the G.W.R. 98,290, and the Southern 66,399; the railway employees of the L.P.T.B. number 14,263. These figures give a fair idea of the comparative size of the various railways.

Increases since last year are mainly in conciliation grades (+ 2,627) and workshop and artisan staff (+ 1,843). A good feature is that recruiting in junior posts, which had to be stopped during the "depression," has begun again, the number of juniors this year showing an increase over 1935 of 2,350. The return discloses that the average earnings of clerical, supervisory, &c. staff (excluding those entered under ancillary businesses) were 92s. 0d.; for conciliation grades 64s. 5d.; and for shop and artisan staff 69s. 1d. All these figures are higher than those for the corresponding period of 1935, although in each year all earnings were subject to a deduction of 2½ per cent. The return also gives details of the average rate of pay and the average earnings of certain selected grades of adult staff. The earnings of engine drivers and motormen are given as 99s. 4d. or 11s. 10d. more than their average rate of pay; firemen and assistant motormen earn on the average 78s. 2d., an excess of 8s. 10d. over the average rate of pay, and engine cleaners earn 54s. 9d. or 2s. 1d. over the average rate of pay. These figures are of importance in view of the comprehensive claim which the Associated Society of Locomotive Engineers has put forward to the main-line railway companies. Guards on an average earn 9s. 2d. more than their rate of pay (64s. 10d.) and Signalmen's earnings are shown as 66s. 4d., an excess of 6s. 8d. The difference between these average earnings and rates of pay are, of course, due to the extra rates paid for overtime, night duty, and so forth.

Another table in the return sets out comparable figures, 1936 with 1935, for mechanics and artisan staff, and we note that erectors, fitters, and turners employed in the locomotive, carriage, and wagon department earn on the average 80s. 11d., or 17s. 4d. more than the average weekly wage (63s. 7d.). We have had occasion to refer recently to the enormous sums paid by the railway companies in salaries and wages. The return now shows that for the year 1935 the total sum paid was £101,295,242, an increase of nearly two million pounds (£1,910,242) over 1934. The provisions of decision No. 1 of the Railway Staff National Tribunal, which came into operation at the beginning of the first full pay following August 16, 1936, will have the effect of adding more than another million pounds to this colossal bill.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Railways and the Value of an Estate

The Railway Club, 57, Fetter Lane, E.C.4
August 24

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—The sale of the Thorndon Hall estate for the purposes of a development, which would not have been possible but for the existence of the Colchester line of the L.N.E.R. (originally Eastern Counties Railway), forms a fitting centenary celebration of one of the most glaring instances of the "blackmail" levied by great landowners on the infant railway industry. In 1836 the Eastern Counties Railway was promoting its Bill for a railway from London to Norwich which would have been visible from the windows of Thorndon Hall although its proposed course was nowhere less than a mile away. The railway also would have interfered—it was alleged—with fox hunting, to which pursuit the 11th Baron Petre was addicted.

The said Lord Petre was accordingly anxious to force the railway to go north instead of south of the main London to Chelmsford road, and only agreed to withdraw his opposition to the Eastern Counties Bill on the terms of an agreement with the provisional committee that the railway company should not enter on the sacred soil of Petre-land without first paying £20,000 at which he put the value of the land to be taken (not worth, according to Francis's "History of the English Railway," more than £5,000) and £100,000 as "compensation for damage to the estate." The promoters agreed to these terms believing it would be practicable to make the line north of the highroad and have this deviation authorised by a subsequent Bill.

After it had obtained its Act, the Eastern Counties Railway found it impracticable to adopt the deviation and struggled unsuccessfully to adopt the promoters' contract on various grounds including the plea that it was contrary to public policy thus to rob Paul to pay Petre. It is fair to the then Lord Petre to say that the railway's difficulties were in fact due to the clumsy way in which it handled the matter and its delay in applying to dissolve the interim injunction he had obtained *ex parte* until almost the eve of the expiration of the two years' period for compulsory acquiring lands. So the 11th Baron Petre got his £120,000 from the railway line, whose existence has enabled his successor to obtain a price acceptable to him for the estate.

Landowners, it may be noted, levied excessive tribute upon transport a hundred and fifty years before steam railways came into being, as Roger North recorded in the observations he took in 1676 of the timber railroads from the collieries to the River Tyne that "When men have pieces of ground between the colliery and the river they seli leave to lead coals over their ground, and so dear, that the owner of a rood of ground will expect £20 per annum for this leave."—Yours &c.,

KENNETH BROWN,
President.

A Raucous Railway Signal

London, August 26

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—May I be permitted the courtesy of your correspondence columns in which to voice a protest against the nerve racking "audible" signal in use at Oxford Circus station on the Bakerloo tube? Presumably for the purpose of indicating to the platform staff that a train is overstaying its leave, an electric horn or trumpet, controlled it would seem by a time switch, emits a series of ear piercing blasts which, on occasions, can still be heard after the train has started and entered the tunnel. I have identified the note; it is on the sharp side of middle D although not actually D♯. This may appear to be a quite reasonable choice, but any note hurled at one in loud staccato form can, as we know, be positively offensive. Anyone with knowledge of acoustics can say that it is quite unnecessary, especially in confined sound accentuating surroundings such as a tube railway station, to employ a raucous noise of this sort; a mellow tone pleasing to the ear would amply suffice and no danger would arise of persons lingering to hear the melodious effect that resulted. I have made a note of the reactions of many passengers to this annoyance. Elderly people of both sexes wince, or even start out of their seats, and others, presumably with musical tastes, show signs of acute distress, whilst others again, belonging perhaps to neither category, say things more or less audibly, which are anything but complimentary to the railway authorities.

Regarded as a letter instead of a note, D is well chosen, as it seems to be the one on which many of the passengers rely in voicing their denunciations, as, for instance, the following—all overheard during the past few evenings.

Elderly ladies: "Oh, dear, what a *Dread*ful noise."

One man to another: "What on earth are they making that D——n row for?"

Vice Versa: "D——l of a din, isn't it?"

May we assume that the signal is intended to hurry up passengers entering and leaving the trains as well as the platform attendants, and that translated into words its message is something like this: "Be sharp, or be D——d to you." It is difficult, anyhow, to be natural in the circumstances.—Yours, &c.,

D.V. (*Daily Victim*)

Following the correspondence on Aveling and Porter locomotives which was published in these columns on December 20 and January 10 last, Mr. F. Bruton of 12, Dorncliffe Road, Fulham, S.W.6, has sent us these recent snapshots of one of the old Brill tramroad engines of 1872 now working at Heyford brickworks near Northampton. Note interesting contrast between the old "traction-engine" type and the Royal Scot train hauled by the L.M.S.R. Pacific "Princess Beatrice"

PUBLICATIONS RECEIVED

The Economics of Transport. By Michael R. Bonavia, M.A. London: Nisbet & Co. Ltd., 22, Berners Street, W.1. Cambridge: The University Press. 7⅞ in. × 5 in. × 1 in. 202 pp. Price 5s. net.—This volume, which is No. IX of the Cambridge Economic Handbooks under the general editorship of Mr. J. M. Keynes, offers a skilful treatment within the bounds of "conventional economics" by a keen student of transport. A prefatory note by the General Editor says that "the theory of economics does not furnish a body of settled conclusions immediately applicable to policy. It is a method rather than a doctrine, an apparatus of the mind, a technique of thinking, which helps its possessor to draw correct conclusions." Some such remarks are necessary as an introduction to the reading of this book, for like most conventional economics, it is largely impractical and, in effect, ignores the existence of vested interests. We do not, however, subscribe to the statement that it helps one to draw correct conclusions, but would rather say that the study of economics may be used to that end—like most tools it can be dangerous in unskilled hands.

Mr. Bonavia treats his subject in a logical sequence, beginning with a chapter on the function of transport under the four divisions of utilities of place; the demand for transport; specialisation; and some social effects of transport. It is difficult, however, for the ordinary reader to follow what, if anything, the author advocates, or on what lines he would guide future transport development, excepting that he advances a case for the fashionable and indefinite remedy for all ills, "economic planning." He says that, for instance, where a railway was constructed to serve a new steelworks, and at the same time as it supplied raw materials and distributed the finished product failed to provide cheap and adequate passenger transport in order that the workers might live in healthy surroundings away from their work, it "incurred a definite responsibility." Slums, he adds, are largely a product of the ill-balanced growth of transport. This seems to be a confusion of both ideas and functions. The whole basis of democratic civilisation is the vesting of government—"the greatest good for the greatest number"—in the hands of an elected assembly which authorises or permits private enterprise to develop commercial enterprises within specified limits. Unless it can be shown that a transport undertaking, for example, has transgressed the law, by omission or commission, it is idle to speak of a "definite responsibility," as such could be substituted only by appeal to an undefined moral law lacking universal acceptance.

This criticism is not intended to imply that Mr. Bonavia has skirted the difficulty of finding an equitable basis for government interference in commerce. He sets out clearly the dangers as well as the advantages of monopoly, of national ownership, and of competition, and explains lucidly the changes in policy that appear to have affected the government in its legislative control of transport. It is a thought-provoking volume, and has the great merit that its author possesses and uses an extensive knowledge of railway transport in Great Britain. The worst pitfalls of the application of theoretical economics to a consideration of transport are thereby avoided, and, subject to the safeguard we have mentioned, this book may be recommended as a well-written and readable primer to the subject (a rather unprofitable one, we feel) that it covers.

Evriway Maps. London: Evriway, 6, Castle Bar Hill, W.5. 7½ in. × 3½ in. folded. Price, 3d. each.—The street plan of London has long outgrown the confines of a single sheet that will fold conveniently into the pocket, and already a number of atlases showing London and its suburbs in sections have been published. This new Evriway series, however, shows each London district on a separate small sheet, which unfolded measures 15 in. × 10 in. Thus the visitor to London, or even the Londoner himself who has strayed from his own suburb, may obtain for threepence a convenient guide to the vicinity in which he finds himself. Railways, bus and tram routes, and postal districts are marked, and on the back of each sheet is a street index. These maps, which are being sold from London bookstalls, are based on Ordnance Survey maps, and at present sheets covering some seven districts are available, but we understand that others are in preparation.

Country Walks. First Series. By Charles White. London: London Passenger Transport Board, 55, Broadway, S.W.1. 6¾ in. × 4¼ in. 124 pp. Illustrated. Price 3d. net.—This publication collects into one handy volume a selection of walks from three books now out of print, namely "Chiltern Strolls and Rambles," "Surrey and Kent Strolls and Rambles," and "Bucks, Herts, and Essex Strolls and Rambles." In all, seven counties are covered, and both the directions for the walks and the notes on transport to the various starting points have been brought up to date. The essential features of every walk are shown by a series of very clear maps, whereon are also indicated, perhaps for the solace of the footsore, Green Line coach routes and railway stations. Indexing is done by counties, all the places of interest and beauty spots mentioned being grouped alphabetically under the appropriate headings. Variants such as "all amang the heather O" enliven the more conventionally conceived names for the rambles.

The text of the booklet strikes a readable balance between the necessary instructions and a condensed survey of what is picturesque and historical in the different localities. In length, the walks vary from five to fifteen miles or so, but most of them can be shortened to suit requirements. Fifteen full-page illustrations of great charm are included in the booklet, which should be guaranteed an enthusiastic reception by reason of the extensive area it covers, and the varied types of scenery to which it will introduce many who may hitherto have limited their outings to one well-tried and familiar direction.

Johannesburg.—The latest addition to South African publicity has reached us in the form of a large, golden-coated, well-produced and freely-illustrated booklet, setting forth the present attractions of Johannesburg, and briefly outlining its short but eventful history, the golden jubillee of which is being celebrated by the Empire Exhibition. The booklet also reminds us that 51 years ago what is now this great city, covering 84 sq. miles and having a population of over half a million, had only 50 inhabitants. Railways are dealt with under the heading of "Transportation" and the half-tone illustrations of the Central station give an excellent impression of its size and architecture. In fact, the interior view appears to the London eye more like a really good Hollywood "set" than a railway terminus. The Empire Exhibition has already been mentioned several times recently in our columns. We recommend intending visitors to study this booklet for a concise impression of the city.

French Railway Literature.—Road tours in connection with railway holiday services figure in several attractively illustrated booklets we have received from the French railways. The Alsace-Lorraine and the P.O.-Midi Railways send timetable folders of their road facilities, covering such celebrated tourist areas as the Vosges and the Pyrenees, while from the P.O.-Midi and the State Railways there come particulars of extensive tours in saloon motor coaches through Britanny and Normandy. The Route de Bretagne, for example, offers two six-day and one four-day itineraries, all connecting at various points with the railways concerned. The Route de Normandie tour (one four- and one three-day intinerary) is run in connection with the State Railways. Passengers are able to join the coaches where convenient, and may make either the complete circuit or only a part thereof. Other booklets in the series we have received include a well-written and artistically illustrated account of the territory served by the Alsace and Lorraine, and various smaller booklets in colours dealing with individual centres. The State Railways publish two very cheerfully coloured descriptive booklets entitled "Normandy," and "Between Loire and Gironde," and also a pocket folder map for anglers showing the areas for coarse fish, trout, and salmon on their system.

THE SCRAP HEAP

WHEN A TIMETABLE IS A TIMETABLE

We are officially informed that every train which arrived at Liverpool Street station, L.N.E.R., on the morning of August 20 up to 11 a.m., *i.e.* including the rush-hour, arrived to time.

* * *

A Lynton & Barnstaple carriage, which now rests in the garden of Clannaborough rectory, Bow, Devon, was used recently for a meeting of clergy.

* * *

In Wisbech Museum there is a plate, one of which was fixed to every locomotive on the Great Eastern Railway to prevent seizure by the sheriff during the company's insolvency in July, 1867. This plate, which is about 6 in. by 8 in., reads as follows:—

TAKE NOTICE

This engine is the Property of ALEXANDER TRACY of Cambridge in the County of Cambridge; WILLIAM BOOTH, of Eastwood in the County of Nottingham; and JOHN McMAHON, of No. 1, St. John's Grove, Brixton, in the County of Surrey; and the use thereof is rented of them by the Great Eastern Railway Company.

JANSON, COBB & PEARSON,
41, FINSBURY CIRCUS,
LONDON, E.C.

JULY, 1867.

SOLICITORS FOR THE SAID
ALEXANDER TRACY,
WILLIAM BOOTH, AND
JOHN McMAHON.

This relic was presented to the museum by Mr. R. Reynolds-Rowe of Cambridge in October, 1888.

* * *

LONDONERS ARE HONEST

London's transport officials have a touching faith in the honesty of the travellers for whom they cater. So much so that there is little prospect of the London Passenger Transport Board ever following the example of Bournemouth and Glasgow, and installing "honesty boxes" on their vehicles, in which short-stage passengers can drop the fares which conductors have not had time to collect. The "honesty box" has proved a great success in Glasgow, where they have halfpenny fares, and where they have big rush periods.

In Bournemouth the experiment is quite a new one. The boxes were installed by the Corporation only a week ago. In their first week, they have yielded £8 16s. 8d.—equivalent to 2,120 penny fares. An official of the London Passenger Transport Board told an *Evening News* representative there was very little possibility of "honesty boxes" ever being used in London. "We consider that most of our passengers are perfectly honest," he said, "and that they understand the obligation to find the conductor."

* * *

The recent celebration of the one hundredth anniversary of the completion of Samuel F. B. Morse's experiments in perfecting the electric telegraph, which was observed by old-time Canadian National telegraph operators in conjunction with Canada's railway centenary, has shown that Prince Edward Island probably has the honour of having in Miss Penelope Howatt of Crapaud the oldest living woman Morse operator in Canada. Miss Howatt, who is 93 years old, was operator in charge of the telegraph office at Crapaud, P.E.I., from March, 1876, until May, 1915.

* * *

No railway company has yet managed to compete with excursion prices once proposed by Charles Dickens. During the summer of 1851, in *Household Words*—the weekly conducted by Dickens and written almost exclusively by him—he said that what the country needed was a railway Rowland Hill. His proposal was that excursionists, like letters, should be sent at a flat rate within an agreed area. The area he proposed was within a fifty-mile radius of London and the flat rate he proposed was 6d. His argument for cheapness was based on modern mass production theories—the bigger the input of passengers, the lower the cost per passenger. Nearly 6,000, said Dickens, went by the first London excursion train to Bristol and Bath, and the excursion had to be run in two trains of 25 coaches each. If omnibuses can carry a passenger two hour for 6d., he said, surely "a railway train, occupying only the same time in the journey, stuffed full of sixpenny passengers, would yield a handsome profit."—*From the "Yorkshire Post."*

(*See editorial note on page* 357)

No. 8 of a series of "claims prevention" posters recently issued by the Chief Goods Manager, Great Western Railway, for exhibition to the staff

* * *

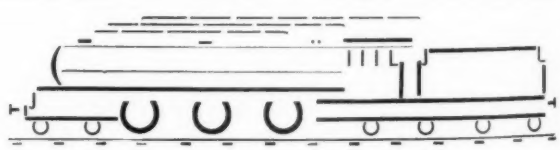
FUEL AND WATER ECONOMIES

It is reported in the *Canadian National Railways Magazine* that some 4-6-0 type wood burning locomotives purchased in the late '90's usually burned more wood on a run than the tenders could carry, and, as a consequence, the early train crews became adept at stealing cordwood, fence rails, and old sleepers for engine fuel. Engines hauling the heavier trains also ran short of water at times and in winter the common makeshift was to melt snow to replenish the boiler.

The Ingenious Compositor

PICTURE BUILDING WITH TYPE

By S. F. S.



A MANUFACTURER of locomotive material wanted an advertisement illustrated with a locomotive, but wished to avoid the making of a drawing and block.

A typical photograph was studied for the essential lines and a layout carefully drawn indicating exactly the rules, characters, and spacing required. The type is Gill Sans series throughout; capital "C's" for the wheels, "T's" for buffers, "I's" for sleepers, 18-point parenthesis for smokebox front, etc. The light rules and omission of coupling rods to the driving wheels help to give quite a good impression of speed.

Facsimile of an editorial notice in the "Printing Review." The design was prepared for the advertisement of the Eyre Smelting Co. Ltd., the original form of which was included in our advertisement pages of July 31 last; after minor modification it appeared in the half-page announcement of this advertiser last week

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

CANADA

Two New Types of Locomotive

In addition to the 6400 Canadian National Railways semi-streamlined 4-8-4 locomotives (described in THE RAILWAY GAZETTE of June 26), two other interesting new types have recently been completed, a Mikado for the heaviest Canadian National freight services, and a "Northern" (4-8-4) passenger engine for the Temiskaming & Northern Ontario Railway, both built by the Canadian Locomotive Company. The following are some of their principal dimensions:—

	C.N.R. 2-8-2	T. & N.O. 4-8-4
Cylinders	24 × 30 in.	22½ × 30 in.
Coupled wheels, diam.	5 ft. 3 in.	5 ft. 9 in.
Boiler pressure ...	265 lb. per sq. in.	275 lb. per sq. in.
,, diameter—		
Minimum ...	6 ft. 9 in.	6 ft. 4 in.
Maximum ...	7 ft. 6 in.	7 ft. 2 in.
Grate area	70·25 sq. ft.	70·3 sq. ft.
Heating surface:		
Tubes	3,065 sq. ft.	3,407 sq. ft.
Firebox	339 ,,	370 ,,
Superheater ...	1,452 ,,	1,665 ,,
Total ...	4,856 ,,	5,442 ,,
Weight in working order:		
Total engine and tender ...	276 tons	291 tons
Total engine ...	151 ,,	166 ,,
Total for adhesion	106 ,,	98 ,,
Tractive effort—		
Without booster	56,200 lb.	54,500 lb.
With booster ...	—	64,950 ,,
Tender capacity:		
Water	11,600 Imp. gall.	11,000 Imp. gall.
Coal	20 tons	20 tons.

Both engines are fitted with two Nicholson thermic syphons and B.K. automatic stokers, and the 4-8-4 has also a Franklin booster and S.K.F. roller bearings in all bogie axleboxes.

It may be remembered that the T. & N.O.R. is owned by the State of Ontario and runs northwards to the Southern shore of Hudson Bay.

SOUTH AFRICA

Restoration of Economy Cuts

At a recent conference between the Minister of Railways and Harbours and representatives of the United Railway Service Staff Associations, an agreement was reached in regard to the full refund of the 1932-33 economy cuts. Previously the 5 per cent. responsibility allowance from January to June, 1936, had been set off against the refund. The present agreement provides:—

(1) That the administration will refund in full the amount of Responsibility Allowance set off against the cuts.

(2) That the Responsibility Allowance will be paid until March 31, 1939.

(3) That for a period up to and including March 31, 1939, the railwaymen will not put forward any major claim in connection with their emoluments or working conditions.

A major claim is taken to be one which, if granted, would involve the surrender of an appreciable amount of revenue. There is no objection to representations being made in the ordinary way in connection with matters affecting a particular section of the service, if such representations do not amount to a major claim.

Where the administration and the staff organisation concerned cannot agree as to whether a claim is a major or a minor claim, a meeting of the joint organisations will be called by the Minister, at which the matter will be thrashed out.

It is understood that the administration and the men respectively are relieved from the obligation set out under (2) and (3) of the agreement in case of any substantial and unforeseen change in the position of the administration or the staff; if, for example, the cost of living rises substantially or, conversely, if railway earnings drop.

INDIA

Rail-Ship Competition

Coastal shipping interests have recently been in conference with the railway authorities in Bombay and Calcutta with a view to the elimination of cut-throat competition between the railways and shipping for port-to-port traffic. No definite conclusions have yet been reached, but it is understood that a proposal to pool and distribute the earnings from port-to-port traffic is being considered. In the meantime, the North Western Railway has notified an enhancement of wheat freights from the Punjab to Calcutta, Bombay and Madras from August 1. This is probably a result of the conference, held at Delhi in December last, to discuss the question of railway and shipping competition. Karachi business men welcome this action on the part of the N.W.R., as they had long felt that the reduction of freight for the all-rail route constituted an unnecessary competition with the rail-cum-sea route via Karachi, which had adversely affected the trade of Karachi. It is expected that the enhancement of the railway rates will stimulate exports from Karachi to other Indian ports.

FRANCE

Stricter Level Crossing Rules

With a view to reducing the number of accidents at level crossings, M. Bedouce, Minister of Public Works, recently issued instructions to all railway authorities to prohibit level crossing keepers from raising the barriers to allow vehicles to cross the lines when the approach of a train had been signalled. Hitherto, the rules of some of the railways have not been strict in this respect. They have allowed keepers to use their own judgment as to whether there was sufficient time to let waiting vehicles pass. Some serious accidents have resulted, as a crossing keeper was apt to yield too readily to the protests of impatient drivers.

A preliminary inquiry showed that on the P.L.M. system, it was made a hard and fast rule to keep the barriers closed once the train was signalled. All the railways must now conform to this practice, and the Minister in a public notice has urged the drivers to accept the ruling in their own interest, and to await the reopening of the barriers in patience.

Elimination of Crossings

M. Bedouce is also taking steps to include in the programme of public works under consideration by Parliament, the elimination of a number of crossings, that offer serious hindrance to the growing road traffic. Methods of signalling at other crossings are to be improved.

The total number of level crossings in France, according to figures dating a few years back, was 34,852, of which 28,524 were in charge of keepers and 6,328 were unguarded. Some 2,000 were noted as particularly dangerous, causing about 500 accidents a year. In the Paris district many of the most dangerous have been done away with in the last few years, and some also in the provinces. But many plans are held up by the great expense of providing over- or under-bridges for road traffic. It is estimated, however, that elimination of about 300 of the worst crossings would cut down accidents by 60 per cent. and thus substantially improve the road safety factor.

The Rolling Stock Industry

Rolling stock manufacturers are finding it difficult to readapt the industry to the new social laws imposing increased wages, paid holidays and the 40-hr. week. In recent years the industry has gone from bad to worse, owing to the sharp decline in orders for new stock. According to the latest report of the Chambre Syndicale, the workshops have lost nearly three-fourths of their workmen in the last five years; whereas in January, 1930, there were still 25,000 employed, the number had fallen in 1936 to 8,500. The drop in orders placed, and therefore staff, has been nearly proportional to the fall in railway budgetary credits, from Fr. 1,572 million in 1931, to 453 millions in 1935, and to Fr. 350 millions in 1936, a decline of more than 75 per cent.

Orders for 709 passenger coaches were placed in 1930, but the figure fell to 126 in 1934; there was, however, a slight increase to 225 in 1935. The number of railcar deliveries in 1934 was 148 and the number ordered in 1935 increased to 222. This improvement was, however, insignificant as compared with the ruinous decrease in orders for goods wagons. From 17,145

wagons in 1929, the orders fell to 12,525 in 1930, to 2,345 in 1933, and to 100 in 1935. At the same time orders for new locomotives fell to virtually nothing. From 404 locomotives in 1930, the orders fell to 103 in 1931, to 25 in 1933, and to 8 in 1935. All these declines brought corresponding discharges of workmen.

Goods Trains on Metro Lines

Goods trains may be admitted to run on the Metro lines at certain hours in the night, according to a news item in the Paris papers. Presumably these trains will bring in market-garden produce, and thus replace the steam trains, that now use the last remaining tram lines, from the suburbs during the night. They will be hauled by electric locomotives specially designed for rapid acceleration with heavy loads, and will probably begin to run over the Metro next year, as soon as the P.-O. lines from Paris-Luxembourg to Sceaux and to Massy-Palaiseau, about ten miles south of Paris, are taken over and operated electrically by the Metro. Special sidings are to be constructed for these trains at each of the underground stations between the Luxembourg and the suburban open-air line, so that any train unable to get out of Paris in time for the resumption of the ordinary daily Metro traffic, may be stabled. The trains must not be longer than 300 m. (984 ft.).

PORTUGAL

Beira Alta Railway and its Latest Locomotives

The Beira Alta Railway in Portugal is now the only 5 ft. 6 in. gauge line not worked by the Portuguese Railways Company. Its main line forms an important connecting link between that company's system at Pampilhosa and the National Western of Spain Railways at Villar Formoso, 125 miles in length; the whole system is 157 miles long.

The line is of single track laid with rails of light section, the maximum axle load being limited to 14½ tons. Owing to the increasing weight of trains, including the Lisbon section of the Sud express, it was found that the existing locomotives were no longer capable of dealing with the traffic and consequently a new 4-8-0 series was obtained from Henschel & Sohn in 1930. These engines, which were described and illustrated in THE RAILWAY GAZETTE of December 26 of that year, are four-cylinder compounds and are fitted with superheaters, A.C.F.I. feed-water heaters, Kylala blast pipes, speed recorders, and electric headlights. They are required to haul 260-ton trains at maximum speeds of 56 m.p.h., and have proved very successful in service.

On a recent visit to the Pampilhosa sheds your correspondent was impressed by the remarkable cleanliness of the locomotives, in fact, they were the cleanest he had ever seen. This desirable result is due to a system of monthly premiums awarded for the best kept locomotive. The competing staff was evidently enthusiastic, and on the occasion of the visit several men were busily engaged in wiping down an engine as can be seen in one of the accompanying illustrations [see page 378.—ED. *R.G.*]. Copper chimney caps, brass boiler lagging bands, steel rods, and motion work were all highly polished, and even such parts as couplings and chains were burnished. It was pleasant to find one railway insisting on such a high standard of maintenance, and the obvious pride of the staff concerned in its engines.

NEW ZEALAND

Elimination of Level Crossings

The sum of £150,000 is to be expended this year in the elimination of dangerous level crossings. Work is to begin at once on 62 crossings, but 200 crossings are scheduled for elimination within a period of five years at a cost approaching £1,000,000.

CHINA

Chengtu-Chungking Railway

An agreement has been entered into for the construction of the Chengtu-Chungking railway under a Chinese-French contract which provides for a loan of Fr. 23,000,000 to the Central Government under guarantee of several Chinese banks. The work is to be carried out under French supervision.

Chekiang-Kiangsi Railway

Construction work has begun on the bridge over the Kiang river, near Nanchang, on the Nanchang-Pinghsiang extension of this railway. It is anticipated that the work will be completed and the bridge ready for traffic in from twelve to fifteen months.

Peiping-Shanghai Accelerated Services

As from August 15 the timings of the through expresses running between Peiping and Shanghai are being accelerated, reducing the running time from 38 hr. to 35 hr. 40 min. between the two cities. The express leaving Peiping daily at 6.0 p.m. is due at Shanghai at 7.40 a.m. on the third day. In the reverse direction the express leaving Shanghai at midnight is due at Peiping on the third day at 1.50 p.m.

Chuchow-Hsianghsiang Railway

A survey has been completed for a new line, about 50 miles in length, between Chuchow—near Changsha, on the Canton-Hankow Railway—and Hsianghsiang, and construction is to begin in the near future. The line is likely to be the first section of the new trunk route running through the provinces of Hunan and Kweichow. It is anticipated that the whole line will take three years to complete.

UNITED STATES

Traffics and Earnings Continue to Rise

The major recovery in traffics by the U.S.A. railways continues. Preliminary estimates for July place the increase in gross revenues at 27·5 per cent. over those of the same month in 1935. Both freight and passenger traffics share in the improvement, the latter being sharpest in those areas where lower fares have been in effect for several years, and less pronounced in the East where greatly reduced fares were inaugurated on June 1 only. Preliminary estimates indicate the increase in passenger revenues in July of this year over those of 1935 at 20·2 per cent. in the East; 43 per cent. in the Pocahontas region (on the border between East and South); 23·9 per cent. in the South; and 26·7 per cent. in the West. Net earnings will not show so much of a rise as gross revenues, because railways have at last taken courage and are spending money freely on maintenance, in the effort to obliterate some of the scars left by several years of under-maintenance.

Performance of Lightweight Trains

The Bureau of Statistics of the Interstate Commerce Commission has issued a monograph on the "New Types of Light Weight Passenger Trains" which sets forth all the significant available statistics on these spectacular new trains in the U.S.A. Detailed figures are given in compact form as to capital, maintenance and operating costs—related to the size, weight, kind of power used and nature of service—of 18 of the trains.

Not the least interesting feature of it is a tabulation of each accident, however trivial, in which any of these trains has been involved, showing the causes, the extent of the damage and the cost of repairing it. Most of the accidents were occasioned by striking automobiles at level crossings, although there were instances also of broken bearings which have proved very expensive. One such accident did damage to the tune of £3,250. On another train, an axle failure, not costly *per se*, led to a decision to replace all the axles in the train, at a cost of £3,359.

Since the trains vary so widely in type of construction, power and weight, no average figures of costs including them all can have any significance. Of the four steam trains among the number, however, it is disclosed that average direct operating costs, per train-mile, are somewhat higher than for conventional steam trains (43·9d. as against 42·5d.). The operating costs per seat-mile of all types of train, however (steam, diesel and petrol railcars) are strikingly close, being 0·175d. for steam, 0·15d. for diesel and 0·185d. for petrol railcars. Total direct train-mile costs average 43d. for 7- and 8-car trains, 16d. for 3- and 4-car trains, and 10d. for the petrol railcars.

BRITISH MAIN-LINE TRAIN SERVICES

A comparison of frequency and speed in 1914 *and* 1936

IN estimating the recent progress of railway speed in Great Britain, the services of 1914, prior to the beginning of the war, are usually taken as a datum of comparison. Some ten years later, the principal services had recovered in general to their pre-war level of speed, and since then considerable advances have been made on many routes. An analysis of the fastest times between London and 52 of the principal cities, towns, ports and health resorts in the provinces, in which 70 individual services are concerned, shows that a general average cut of 4·7 per cent. in time has been made. The Southern Railway shows the biggest reduction, with 6·0 per cent., followed by the L.N.E.R. with 5·7 per cent., the L.M.S.R. with 3·7 per cent., and the G.W.R. with 3·4 per cent. It should be emphasised, however, that these figures are purely relative, and that as the Great Western Railway, prior to the war, had admittedly set the highest standard of speed in this country, less subsequent speed progress still leaves the G.W.R. in a pre-eminent position, as was shown by the tabie of fastest British runs which appeared in our July 31 issue. Of individual sections or divisions of British railway, the Great Northern section of the L.N.E.R. claims the greatest increase in the speed of its best services, which have been speeded up by an average of 10·9 per cent.—a striking witness to the Great Northern renaissance on which we commented editorially in the same issue.

The most substantial accelerations in the times of the fastest trains on individual services have been by 77 min. between London and Heysham, L.M.S.R. (but over the 239·0-mile route from Euston in 1936 as compared with the 267·7-mile route from St. Pancras in 1914); 73 min. between King's Cross and Newcastle, L.N.E.R. (the Silver Jubilee); 35 min. and 48 min. from King's Cross to York and Scarborough, L.N.E.R., respectively (the Scarborough Flyer); 30 min. between London and Edinburgh, L.N.E.R. (the Flying Scotsman, itself accelerated 60 min., but beaten in 1914 by the 7¾-hr. night services); and 30 min. between Euston and Glasgow, L.M.S.R. (the Royal Scot, also beaten in 1914 by a night service in 8 hr.). On a percentage basis, other substantial cuts have been made in the best times between London and Portsmouth, Southern Railway (18·9 per cent. less); London and Blackpool, L.M.S.R. (15·2 per cent. less); London and Southampton, Southern Railway (13·6 per cent. less); London and Bristol, G.W.R. (12·5 per cent. less—the Bristolian); and London and Cheltenham, G.W.R. (11·5 per cent. less—the Cheltenham Flyer). On the other hand, the best time between Paddington and Fishguard, G.W.R., is now 15 min. slower than in 1914; there were slightly quicker trains in 1914 between London and Hastings, Derby, and Cambridge (daily) than there are in 1936; but the most surprising case is, perhaps, that of Sheffield, between which city and the Metropolis

FREQUENCY, AVERAGE JOURNEY TIME, AND SPEED OF PRINCIPAL BRITISH EXPRESS SERVICES, 1914 AND 1936

Railway	Town	Distance from London	Express Trains Daily in 1914			*Corresponding No. in 1936			Reduction in Average Time, 1914–36		Total Express Trains Daily in 1936			Improvement in Facilities, 1914–36		
			No.	Average			Average				No.	Average		Frequency	Speed	Mean
				Time	Speed†		Time	Speed†				Time	Speed†			
		miles		h. m.	m.p.h.		h. m.	m.p.h.	min.	per cent.		h. m.	m.p.h.	per cent.	per cent.	per cent.
S.R. ...	Brighton ...	50·9	33	1 12	42·4		1 00	50·9	–12	–16·7	43	1 01	50·1	+30·3	+18·2	+24·3
S.R. ...	Southampton ...	79·2	14	1 50	43·2		1 31½	50·8	–18½	–16·8	24	1 39½	47·8	+71·4	+10·6	+41·0
G.W.R. ...	Birmingham ...	110·6	17	2 03	53·9		2 14½	49·7	+11½	+ 9·4	16	2 10½	50·9	– 5·9	– 5·6	– 5·7
L.M.S.R. ...	Birmingham ...	112·9	20	2 11	51·7		2 06½	53·6	– 4½	– 3·4	18	2 05	54·2	– 9·0	+ 4·8	– 2·1
L.N.E.R. ...	Norwich ...	115·0	12	2 54½	39·5		2 41	42·9	–13½	– 7·7	12	2 41	42·9	Nil	+ 8·6	+ 4·3
G.W.R. ...	Bristol	118·3	13	2 21½	50·2		2 03½	57·5	–18	–12·7	18	2 11½	54·0	+38·5	+ 7·6	+23·0
G.W.R. ...	Cardiff	145·1	14	3 08½	46·2		2 51	50·9	–17½	– 9·2	15	2 52½	50·5	+ 7·1	+ 9·3	+ 8·2
L.M.S.R. ...	Sheffield ...	158·5	19	3 25	46·4		3 22	47·1	– 3	– 1·5	19	3 22	47·1	Nil	+ 1·5	+ 0·8
L.N.E.R. ...	Sheffield ...	164·7	17	3 28	47·5		3 25½	48·1	– 2½	– 1·2	17	3 25½	48·1	Nil	+ 1·3	+ 0·7
L.N.E.R. ...	Leeds	185·8	12	3 51	48·2		3 36	51·6	–15	– 6·5	17	3 43	50·0	+41·7	+ 3·7	+22·7
L.M.S.R. ...	Manchester ...	188·5	14	3 51	49·0		3 40½	51·3	–10½	– 4·5	14	3 40½	51·3	Nil	+ 4·7	+ 2·4
L.M.S.R. ...	Liverpool ...	193·7	14	4 05	47·4		3 42½	52·2	–22½	– 9·2	14	3 42½	52·2	Nil	+10·1	+ 5·2
L.M.S.R. ...	Leeds	196·0	18	4 09	47·2		4 15½	46·0	+ 6½	+ 2·6	16	4 12½	46·6	–11·1	– 1·3	– 6·2
G.W.R. ...	Plymouth ...	225·5	11	4 47½	47·1		4 33	49·5	–14½	– 5·0	16	4 47	47·2	+45·5	+ 0·2	+22·9
L.N.E.R. ...	Newcastle ...	268·3	10	5 40½	47·3		4 52½	55·0	–48	–14·1	14	5 04½	52·9	+40·0	+11·9	+26·0
L.N.E.R. ...	Edinburgh ...	392·7	8	8 18	47·3		7 32	52·2	–46	– 9·2	14	7 52	50·0	+75·0	+ 5·7	+40·4
L.M.S.R. ...	Glasgow ...	401·4	8	8 43	46·0		8 19½	48·2	–23½	– 4·5	9	8 26½	47·6	+12·5	+ 3·5	+ 8·0
L.N.E.R. ...	Aberdeen ...	523·2	7	12 12½	42·9		11 26½	45·7	–46	– 6·3	7	11 26½	45·7	Nil	+ 6·5	+ 3·3

* These figures show the average time and speed of a number of the fastest services in 1936 exactly equal to the total number of services on which the 1914 figures are based. † Inclusive of intermediate stops.

the three competing routes of 1914—the Great Central, Midland, and Great Northern—could all show better times than in 1936, the first-mentioned by 9 min., and the others by 2 min. each.

However, improvements in the frequency and average speeds of long-distance train services are of even greater importance than cuts that are confined to the fastest trains only, and in this respect, as is shown in the accompanying table, some very substantial advances, on certain British services at least, have been made. Three groups of times appear in this table. On the left is shown the number of express trains which operated in 1914 over each of the eighteen routes listed, with their average journey times and combined average speed. In the centre, an exactly corresponding number of trains is selected in 1936 (the fastest of the daily trains, if the number of trains has been increased in the interim, or including one or two semi-fast trains, if the frequency of service has been reduced), in order to give a comparison of average speed on an equal footing between the two years. On the right appear the average times and speeds of all the express trains operating over the individual routes in 1936, whether more or less in number than in 1914, to give a true comparison of facilities. The last three columns of the table show, on a percentage basis, first, the increase or decrease in the frequency of service offered, then the increase or decrease in average speed, and, finally, the mean of these two figures, as giving some indication of the improvement in facilities during twenty-two years of development.

Comparing the first and second groups of figures, the most outstanding advances in service speed have been those of the Southern Railway to and from Brighton and Southampton—16·7 and 16·8 per cent. respectively. But in view of the distance of 268·3 miles involved, the L.N.E.R. must be given credit for the most notable of all the mass accelerations, that of 14·1 per cent. by ten daily services between King's Cross and Newcastle, which has raised the combined average speed of these services to the high figure of 55·0 m.p.h. Even if the Silver Jubilee be omitted from this average, and the next two fastest trains substituted, the average curtailment of journey is still 31 min., and the percentage improvement 9·1. The average speed of 52·2 m.p.h. by eight trains daily between London and Edinburgh is also good.

The highest average speed in this group is that of the G.W.R. between Paddington and Bristol, where thirteen daily trains now operate at a combined average speed of no less than 57·5 m.p.h.; the acceleration from 47·4 to 52·2 m.p.h. of the L.M.S.R. Euston-Liverpool service is also commendable. The only material reduction in average speed is seen in the case of Birmingham, G.W.R., whose best 17 trains to and from Paddington average 11½ min. longer in time than the best 17 in 1914—a result partly caused by the withdrawal of certain 2-hour trains, and partly by the deceleration of various others from 120 to 125 min. Leeds, L.M.S.R., also has a slower service to and from London in 1936 than in 1914.

In the final group of figures it is perhaps the variation in the improvements of service which have been effected that is their most surprising feature. Against a 41·7 per cent. increase in frequency and a 3·7 per cent. increase in the average speed of the London-Leeds service of the L.N.E.R., for example, there is the fact that the London-Sheffield service of the same company has no increase in frequency and practically none in speed. Again, while both frequency and speed are increased in the case of the L.M.S.R. London-Manchester and London-Liverpool services, slight though the increases may be, the London-Leeds service of the same company is worsened (so much so, in fact, that the average time for the L.M.S.R. journey is now practically half-an-hour longer than that of the L.N.E.R.), and also the L.M.S.R. London-Birmingham service, for what the latter has gained in time it has more than lost in reduced frequency. By both London-Birmingham routes, therefore, the passenger is in effect worse off now than in 1914; and the loss of some pre-war facilities, such as the 12.50 p.m. two-hour train from Paddington and the corresponding 1.15 p.m. from Euston, is still severely felt.

Chiefly by reason of increased frequency of service, the Brighton and Southampton services of the Southern Railway, the Bristol and Plymouth services of the G.W.R., and the Newcastle and Edinburgh services of the L.N.E.R., all make a fine showing. Again, the fact that the figures are no more than relative must be taken into account, for an improvement of 8·6 per cent. in the average speed of the L.N.E.R. London-Norwich service brings it up to only 42·9 m.p.h., which can hardly be regarded as satisfactory. But the contents of this table do witness to the fact that much general improvement of British long-distance services has been effected during recent years.

Northern Ireland Railways in 1935

An appreciable improvement in results for 1935 of railways wholly and partly in Northern Ireland in comparison with 1934 is shown by the financial accounts and statistical returns supplied to us by the Ministry of Commerce. On the railways wholly in Northern Ireland—the Belfast & County Down, Bessbrook & Newry, Clogher Valley, and Northern Counties (L.M.S.R.)—the net revenue available for appropriation was £2,741 in 1935, compared with a deficit of £19,512 for the previous year. Railway working for these companies showed an actual loss of £37,986, against a loss of £59,466 in 1934, but the profits from the road transport and hotels departments of the Belfast & County Down and the Northern Counties reduced this loss to £17,783 in 1935, and the total net income was £1,093, comparing with a deficit of £20,355 in 1934. Passenger train receipts improved from £324,539 to £343,360, the improvement being chiefly in third class and in parcels, &c., and goods train receipts rose from £176,326 to £180,693, mainly in general merchandise. Railways partly in Northern Ireland include the County Donegal; Dundalk, Newry and Greenore; Great Northern; Londonderry & Lough Swilly; Sligo, Leitrim & Northern Counties; and Strabane & Letterkenny (worked by the County Donegal Railways Joint Committee). They secured a total net income of £136,640 in 1935, compared with £65,986 in 1934. From railway working the Great Northern had net receipts of £89,157, and the County Donegal £2,198, but the others had losses. Passenger train receipts improved from £548,328 to £576,431, and goods train receipts from £513,344 to £557,428, and there were advances under each of the main headings by the five railways as a whole. On the Dundalk, Newry & Greenore the loss on railway working was £12,221, on the Londonderry & Lough Swilly £3,762, and on the Sligo, Leitrim & Northern Counties £3,721. Road transport showed a profit of £8,437 on the Great Northern and of £3,729 on the Londonderry & Lough Swilly, but there were losses of £626 and £140, respectively, on the County Donegal Railways and the Sligo, Leitrim & Northern Counties.

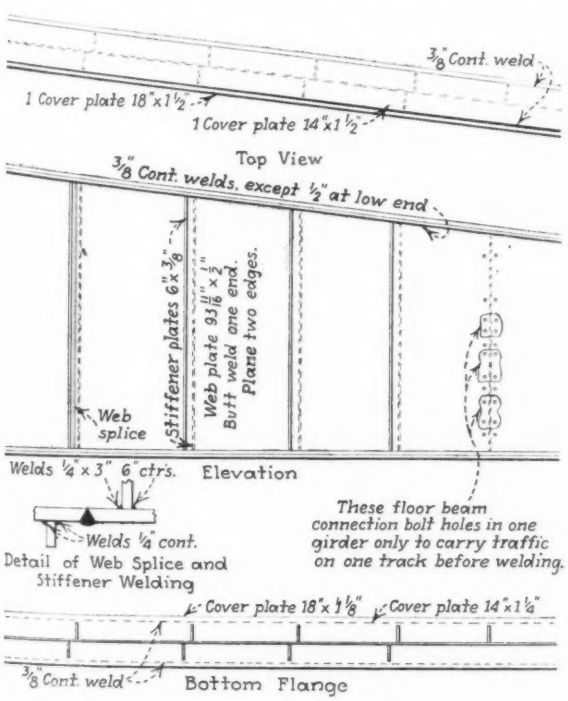
RAILWAY BRIDGE WELDING IN AMERICA

A notable example of the advantages of welding is provided by a 50-ft. bascule span in Florida

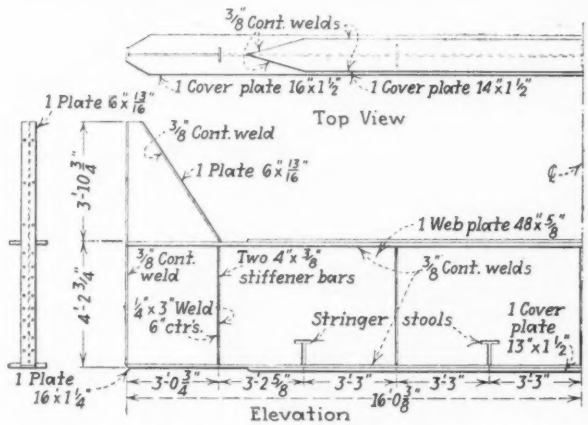
THERE are now two all-welded railway underbridges in the U.S.A., both of which are to be found on the Florida East Coast Railroad, a line with a route mileage of 712, including the long section covering the string of islands, called locally keys, in the extreme south of Florida to Key West. Between these islands the railway is carried on viaducts, some of which are of great length. One of the water openings between two of the keys is crossed by a bridge seven miles long consisting of five miles of deck girder spans with one through draw span, and two miles of 35-ft. span concrete arches. Some years ago the arch adjoining the steel spans developed cracks, and it was decided to place an open deck girder span between the spandrels, leaving the existing arch in place. Tenders for a 48-ft. welded structure of this type, and for an alternative riveted structure, showed that the former would be the cheaper, and such a span was duly constructed. This was the first all-welded railway underbridge to be used on a main line in the U.S.A. The fate of the line it served is referred to in an editorial note on page 359.

An article in our American contemporary, the *Railway Age* for July 18, describes this bridge. It also refers to the damage by accident of a double-line 50-ft. bascule span in a bridge on the same railway across a river near Jupiter, just north of Palm Beach. It is recorded that after due investigation, and in the light of previous experience with welding, both for the construction of the span already mentioned and the repair and strengthening of other steel structures on the Florida East Coast Railroad, it was decided to adopt welding for renewing this bascule span. For welding and riveted construction the estimated time required for erection complete was the same in each case. The lowest quotation was for the welded span, and was submitted by a firm which had previously demonstrated its ability to execute this type of work properly. Accordingly a contract for the fabrication and erection complete of a welded structure was awarded. Fillet welds $\frac{1}{4}$ in. or $\frac{3}{8}$ in. were, as a general rule, used in all members. Dardalet manganese steel rivet bolts were used as field bolts to carry erection stresses, although all field connections were eventually welded. Only certain machinery parts which it might be necessary to renew from time to time were permanently bolted. No rivets were used.

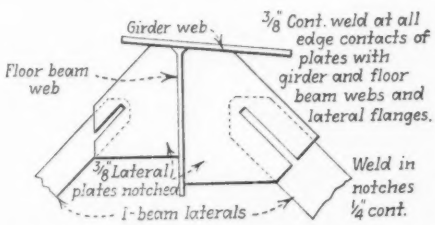
The flanges for the floor beams and main girders were built up of cover plates welded directly to the webs. Where two cover plates were used, the ends of the top one were tapered to a point, the length of the taper being determined by the length of two lines of $\frac{3}{8}$-in. weld required to develop the full section of plate involved. This provided a balanced connection and avoided abrupt changes in section, with their attendant high localised stresses. All web plates were edge-planed throughout. Stiffener plates were continuously welded to the web plates, which themselves were joined with single V-type welds. The members were amply tack welded, connected with clamps, or otherwise provisionally secured. In the final welding of the cover plates, two welders worked on opposite sides of the covers keeping the welding symmetrical, and staggered the welding to avoid warping. Wires were stretched parallel to the web, and the gauge distances noted at intervals to check against movement or warping



Part elevation of girder



Half elevation of a floor beam



Connection of girder and floor beam to tops of laterals

DETAILS OF WELDED BASCULE SPAN, FLORIDA EAST COAST RAILROAD

during welding. Although for the requisite strength it was not necessary, cover plates were continuously welded in order to seal the joints and prevent moisture from entering between the contact surfaces to cause corrosion. The main structure was so fabricated in the shop as to reduce field work to a minimum, and only one scheduled train was delayed for the work on the site.

The weight of the structural steel in the welded span is 208,000 lb. whereas the old riveted span weighed 293,000 lb., a saving of 85,000 lb. The counterweights were reduced 200,000 lb.; exclusive of the holes provided for permanently bolting bearings, gears, &c., which were common to both jobs, there were approximately 19,000 rivets and 51,000 holes in the riveted span. The welded span contains a total of 354 field bolts and a total of 844 holes in the entire structural steel. Covered electrodes were used. The dimensioned sketches reproduced are taken from the *Railway Age*.

American Roller Bearing Locomotives

A statement sent us by the Timken Roller Bearing Company includes some interesting figures concerning locomotive maintenance costs on the Chicago, Burlington & Quincy Railroad, based on the economies made possible by the use of Timken roller bearings on the driving and other axles of certain classes of steam locomotives. These figures are of special interest in view of the careful method of keeping accurate detailed costs followed by the railway company referred to. The roller bearing locomotives are compared with friction bearing ones of the same class and age. The figures are as follows:—

Locomotive Type	Maintenance Cost (General and Running Repairs)
Class M-4 (2-10-4) (Friction bearings)	14·7 cents per mile.
,, M-4A (2-10-4) (Timken roller bearings)	8·2 ,, ,,
	6·5 cents saving per mile using roller bearings.

These figures show a saving of 44 per cent. in favour of the roller bearing locomotive. Engines of the class in question average 9,000 miles a month, which in turn signifies a saving of $585.00 (£116 10s. 8d.) a month per locomotive, or $7,020.00 (£1,398 8s.) per engine a year by the use of roller bearings. It is further stated that the speed of the locomotives has been greatly increased since the application of the bearings. Similar investigations have been made with other types of engines as follow:—

Locomotive Type	Maintenance Cost (General and Running Repairs)
Class 0-5 (4-8-4) (Friction bearings) ..	11·1 cents per mile.
,, 0-5 (4-8-4) (Timken roller bearings)	6·1 ,, ,,
	5·0 cents saving per mile using roller bearings.

The engines of Class 0-5 each average 14,000 miles a month which means that a saving of $700.00 (£139 8s. 10d.) a month per locomotive, or $8,400 (£1,673 6s.) a year per locomotive is being realised through the use of the roller bearings.

In both the foregoing cases Timken bearings were applied to the driving axles of existing locomotives in the friction bearing pedestals. It is to be noted that the foregoing data cover only maintenance costs, and do not take into account savings from greatly increased availability, amounting to two-thirds, also the extra tractive effort available, and increased speed due to the reduction of friction. In conclusion it is remarked that so far as the bearings are concerned, the locomotives can operate 24 hours a day.

High Speed Operating Considerations

At its recent convention at Chicago, the Association of American Railroad Superintendents discussed the operating and signalling aspects of working light-weight steam, diesel, and electric trains at speeds up to 100 m.p.h. As subsequently set forth in a report on the discussion, the first consideration was the effect of such speeds upon the track, and the conclusion arrived at was that, though this new class of traffic—on account of its light axle loadings—does not entail heavier rails, it does necessitate modification in super-elevation and in transition curves, and also in some cases of maximum permissible speed. The following are typical examples of American practice. (A curve of 1 deg. = 87 ch.; of 3 deg., 29 ch.):—

Max. speeds permissible on straight	on curves		Super-elevation on curves		Length of transition curves	
m.p.h.	1 deg.	3 deg.	1 deg.	3 deg.	1 deg.	3 deg.
100	90	60	3½ in.	4¾ in.	310 ft.	312 ft.
90	90	65	3 in.	5 in.	100 ft.	300 ft.
80	80	60	3¼ in.	6 in.	195 ft.	360 ft.
70	70	60	3 in.	6 in.	248 ft.	496 ft.

Drivers must be warned beforehand of the exact positions of all speed restriction boards, usually placed 3,000 ft. before the curves are reached. The second point made in the report is that improvement in braking is constantly being effected, until now it has been shown that a light high speed train can be brought to a stand from 100 m.p.h., with a service brake application, in a distance of slightly under a mile. In this connection it has been found desirable to fix distant signals at 7,500 ft. (2,500 yd.) beyond the home signals: these figures also apply where cab signals are used. Level crossings too, must be protected by longer track circuits, usually from 3,000 to 4,000 ft. Other measures that have been found necessary to ensure fast schedule time keeping, are the respacing of watering and fuelling stations, increased diameter of piping at the former, the elimination of mails and parcels from these trains, and an extension of centralised traffic control. These are some of the features of the discussion and report as outlined by our contemporary the *Railway Age*.

The Sivas-Erzerum Railway, Turkey-in-Asia.—According to an Exchange Telegraph message, work was begun a few days ago on piercing the 11-mile tunnel to the west of Erzerum which is necessitated by the new east-west Turkish railway now being built between Sivas and Erzerum. As we recorded in our issue of July 17 (page 118), construction, which hitherto has been from the Sivas end only, has lately been undertaken also at Erzerum. The whole line is scheduled to be finished in September, 1939.

DIFFERENTIAL GAUGE FOR MEASURING WORN TYRES

IN connection with the process of repairing worn tyres and wheel flanges by the deposit by arc welding of special material (described in *The Railway Engineer* of June, 1933), the Florence workshops of the Italian State Railways are equipped with a differential gauge for comparing the shape of worn tyres with the regulation section. It can thus be decided whether the amount of wear shall be remedied by re-turning, or by the deposition of new material. The instrument is described in a recent issue of our Italian contemporary, *La Tecnica Professionale*, from which the following account is abstracted.

The illustration, Fig. 1, shows the gauge, commonly called the diagram gauge, in use at Florence. To take the profile of a tyre a card, of the type seen in Figs. 2 and 3, is mounted in the gauge which is itself securely held over the tyre; the scriber A of the cursor C is then moved over the worn surface from right to left marking the curve Pr. The cursor is also, of course, movable vertically, and is fitted with a brass marker peg behind the knob P, which is used to scribe the actual mark of the card.

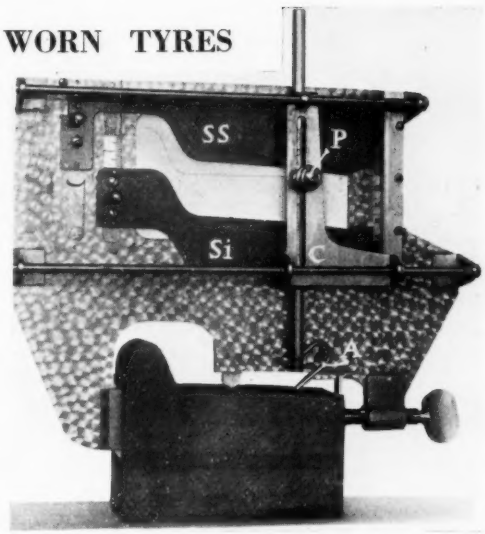


Fig. 1

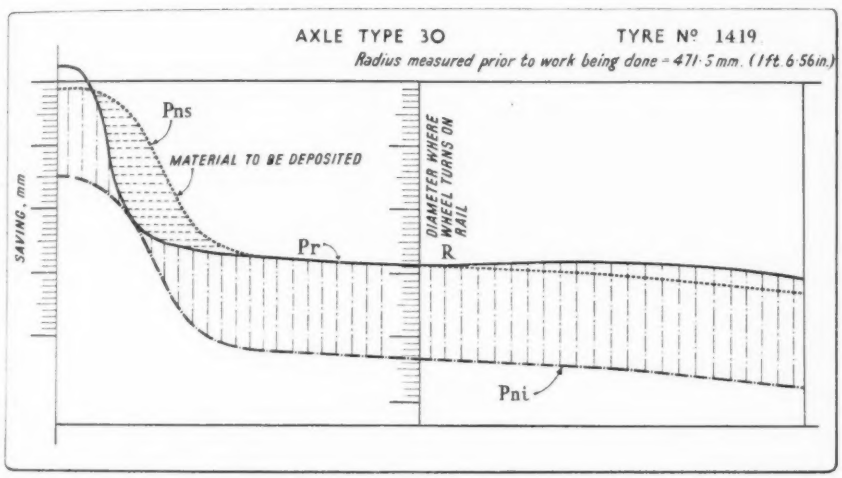


Fig. 2

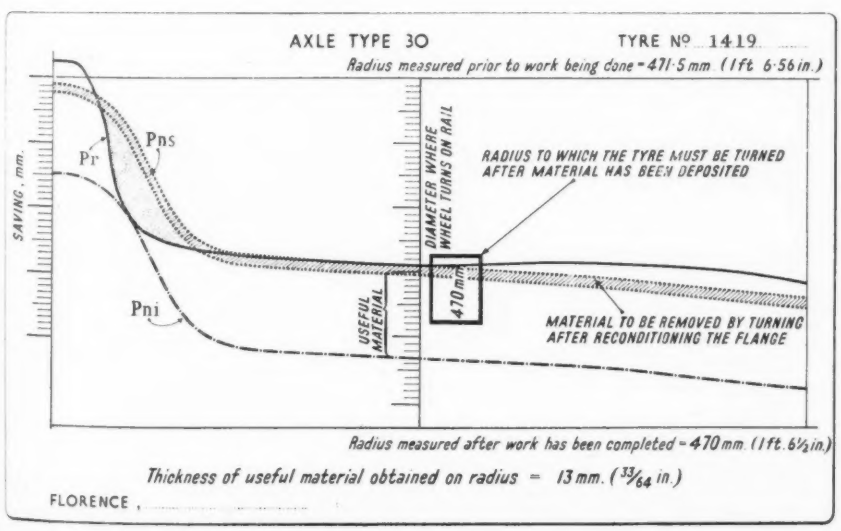


Fig. 3

The latter is chemically prepared and the brass marker makes a sufficiently clear line with very little pressure.

When this has been done the upper gauge plate, SS, formed to the normal profile, is lowered till it touches, at point R, Fig. 2, the mark representing the worn tyre, on the vertical line representing the rolling point between tyre and rail. The lower gauge plate Si (Fig. 1) is then moved up until it also is in contact with the outline of the worn tyre. This done, the two curves Pns, Pni (Fig. 2), are marked off. The space marked in Fig. 2 in chain dotted lines indicates the amount of material which would have to be turned off if the tyre were to be reconditioned by that process only. The part adjacent to the flange marked in plain dotted lines indicates the defective portion of the tyre requiring to be filled up with deposited material.

When this process is used, of course, some turning has necessarily to be done, but in that case the material removed is only about 1 or 1·5 mm. ($\frac{3}{64}$ to $\frac{1}{16}$ in). as shown in the hatched portion of Fig. 3. Even when it is necessary to turn off 5 mm. ($\frac{13}{64}$ in). from the tread or 3·5 mm. ($\frac{9}{64}$ in.) from the lower limit of the hatched portion in Fig. 3, the electric arc deposition method is preferred to re-turning. Beyond these limits the benefit is limited or non-existent and the ordinary re-turning method is used.

BEYER-GARRATT LOCOMOTIVES FOR IRAN

Four Beyer-Garratt locomotives have recently been shipped from this country for operating the 1 in 36 grade on the northern section of the Iranian State Railways

THE second order for locomotives to be constructed in Great Britain for Iran has just been completed at the works of Beyer, Peacock & Co. Ltd., of Manchester, by whose courtesy we are able to illustrate and describe these interesting engines. In our issue of October 5, 1934, we referred to the 2-8-0 type tender engines built by the same firm for the southern section of the Iranian State Railways. The present consignment consists of four Beyer-Garratt locomotives for the heavy-grade section of the northern line, and an advance photograph of the locomotive, taken at the manufacturers' works on the occasion of a visit of His Excellency the Iranian Minister, appeared in our issue of May 15 this year.

About 100 of the 280 miles of line comprising the northern section of the Iranian State Railways, which—as described and illustrated in THE RAILWAY GAZETTE of July 26, 1935—runs from Bandar Shah on the Caspian Sea to Teheran, are occupied with the crossing of the formidable mountain range known as the Elburz, a total rise of nearly 7,000 ft. being necessary to surmount the watershed at its most suitable pass. On the northern side of the summit the ruling grade is as heavy as 1 in 36, which is continuous for 40 miles, with frequent curves of 656-ft. radius, and spirally formed zig-zags. This ascent has also numerous tunnels, one near the summit being nearly two miles long. The descent towards the inner Iranian plateau, is made in about 60 miles, the ruling gradient being 1 in 54. From the foot of these grades on either side, to the Caspian Sea on the one hand and Teheran on the other, the grades are considerably easier, the steepest being 1 in 67. Our article of July last year, which was accompanied by a profile and map, gives some idea of the great engineering and constructional difficulties, and of the standard of locomotive work required on this mountain section of line. As may be recalled, the gauge is 4 ft. 8½ in., and the maximum axleload 15 metric tons.

The locomotive has been designed to metric measurements, and as will be seen has the 4-8-2 + 2-8-4 wheel arrangement; the coupled wheel diameter of 4 ft. 5⅛ in. conforms to an existing standard. The following are the leading dimensions:—

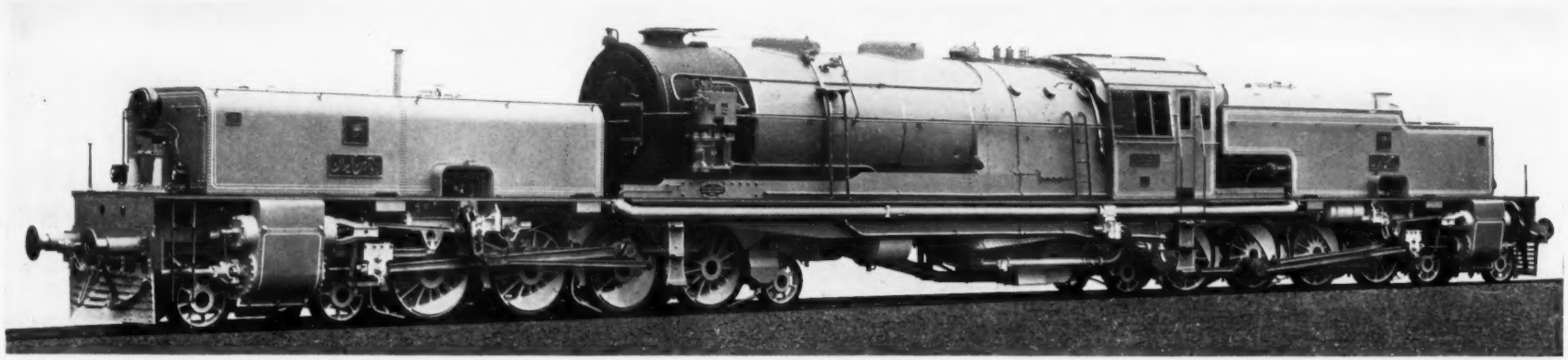
Cylinders (4), dia.	490 mm. (19¼ in.).
,, stroke	660 mm. (26 in.).
Coupled wheels, dia.	1,350 mm. (4 ft. 5⅛ in.).
Boiler pressure	14 kg. per sq. cm. (200 lb. per sq. in.)
Heating surface—	
Tubes (inside)	309·73 sq. m. (3,332 sq. ft.)
Firebox	25·82 ,, (278 ,, ,,)
Total	335·55 ,, (3,610 ,, ,,)
Superheater (outside)	81·2 ,, (874 ,, ,,)
Total	416·75 ,, (4,484 ,, ,,)
Grate area	6·34 sq. m. (68 sq. ft.).
Tractive effort at 65 per cent.	21,380 kg. (47,150 lb.).
,, ,, 75 ,,	24,670 kg. (54,400 lb.).
Maximum axleload	15 tonnes (14·75 tons).
Total weight in working order	204 tonnes (201 tons).
Water capacity	25 cu. m. (5,500 gall.).
Oil capacity	7 tonnes.
Length overall (between buffer faces)	29,420 mm. (96 ft. 6¼ in.).

The new locomotives, which we have had the opportunity of inspecting both during construction and on completion, have been specially designed for operating the 40 miles of 1 in 36 grade at speed, and the mountain section generally. A boiler of large steaming capacity has therefore been provided, which will be oil fired.

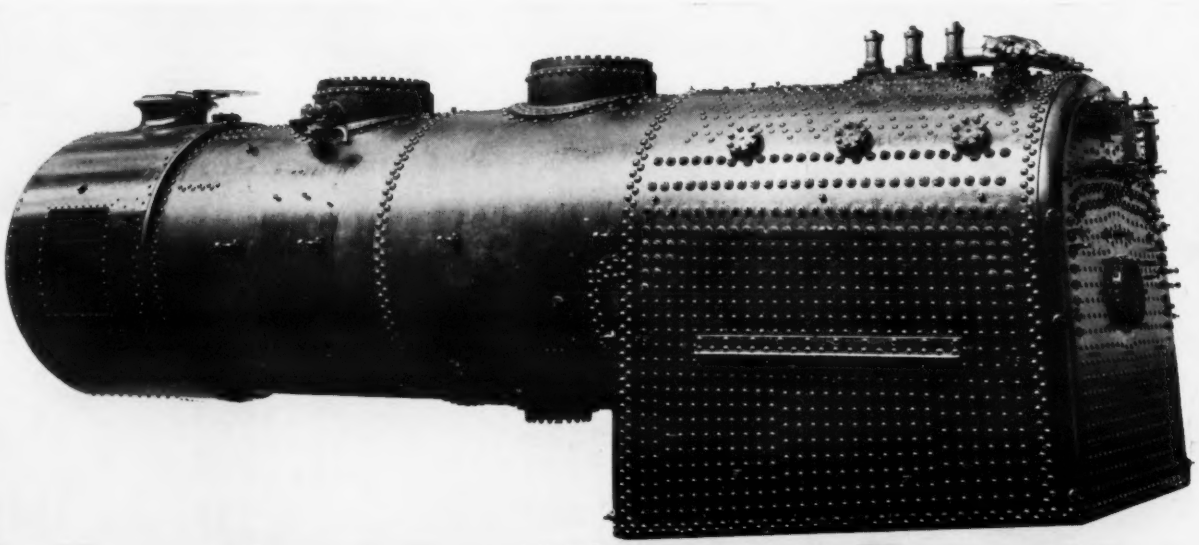
The present load on the easier section is 400 tons, this being handled by the 2-8-0 type at 16 m.p.h. on the 1 in 67. It is intended that the Beyer-Garratt engines shall take the same load at the same speed up the 1 in 36 grade, this speed, which can be considered high for economical working on such a grade, assisting towards better conditions in the tunnels. The ability of the Beyer-Garratt engine to work in both directions will also materially assist by enabling the 1 in 36 gradient to be negotiated chimney trailing.

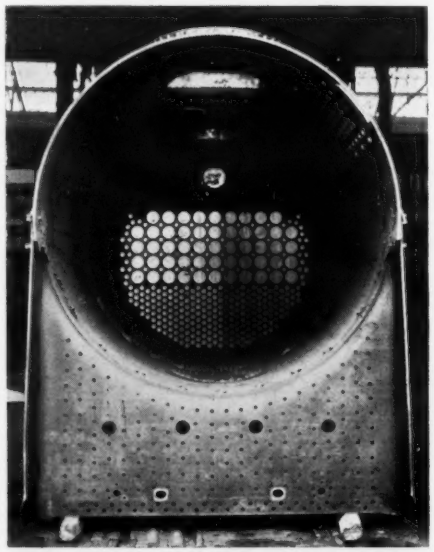
The accompanying illustration of the boiler gives a good idea of its ample proportions and comparative simplicity of design, made possible of course by the fact that it is carried in a cradle, unencumbered by the usual wheels and limiting factors which restrict boiler design in the orthodox type of engine. The barrel, which is 14 ft. 5¼ in. between tubeplates and 7 ft. 6 in. outside diameter, is surmounted by two domes, the usual steam dome being near the firebox, and the front dome containing a water purifier of Beyer Peacock design. Here are fitted circular trays over which the water cascades and deposits scum, &c., into the container fixed underneath the dome, this scum being blown out by means of an Everlasting type valve operated from the cab. The firebox is of the round top type with radial stays; the inside firebox is of copper and fitted with four arch tubes for supporting the arch and improving the circulation. The barrel, fitted with steel tubes, contains 53 superheater flues and 297 small tubes. A photograph taken during construction and reproduced herewith, conveys a good impression of the barrel and firebox proportions. The majority of the firebox stays are of copper, but the two top rows and corner stays are of the flexible type and made of Longstrand steel. Three Ross pop safety valves are provided, adjusted for the working pressure of 200 lb. per sq. in. The superheater is of the Superheater Company's M.L.S. pattern. The boiler is clothed with J. W. Roberts Limited asbestos, as are also the firebox, dome, cylinders, steam and exhaust pipes. The clothing belts are of stainless steel, and the lagging plate of the back head is of planished steel, giving a very attractive finish. The feeding of the boiler is arranged through top feed clackboxes to the water purifier dome, and is operated by two Gresham & Craven No. 14 self-acting injectors. A water lifter for use in case of failure of water supply is provided, and this is also of Gresham & Craven manufacture. It is fitted with a flexible hose 25 ft. long, so as to reach pools or rivers at the line side. The main steam regulator to the cylinders is of the Owen type.

The boiler is slung in the manner usual in the Garratt type of engine, the deep plate frame girders being bound together with massive steel castings. The engine unit frames are also of plate, and in view of the great power developed and onerous duties for which these engines have been designed, are of heavy section and amply stayed throughout. The pivots are of the Beyer, Peacock patent adjustable type, conforming to the firm's latest practice. The horn blocks to the coupled wheels are a horseshoe steel casting, fitted with adjustable wedges. The springs are compensated in two groups,



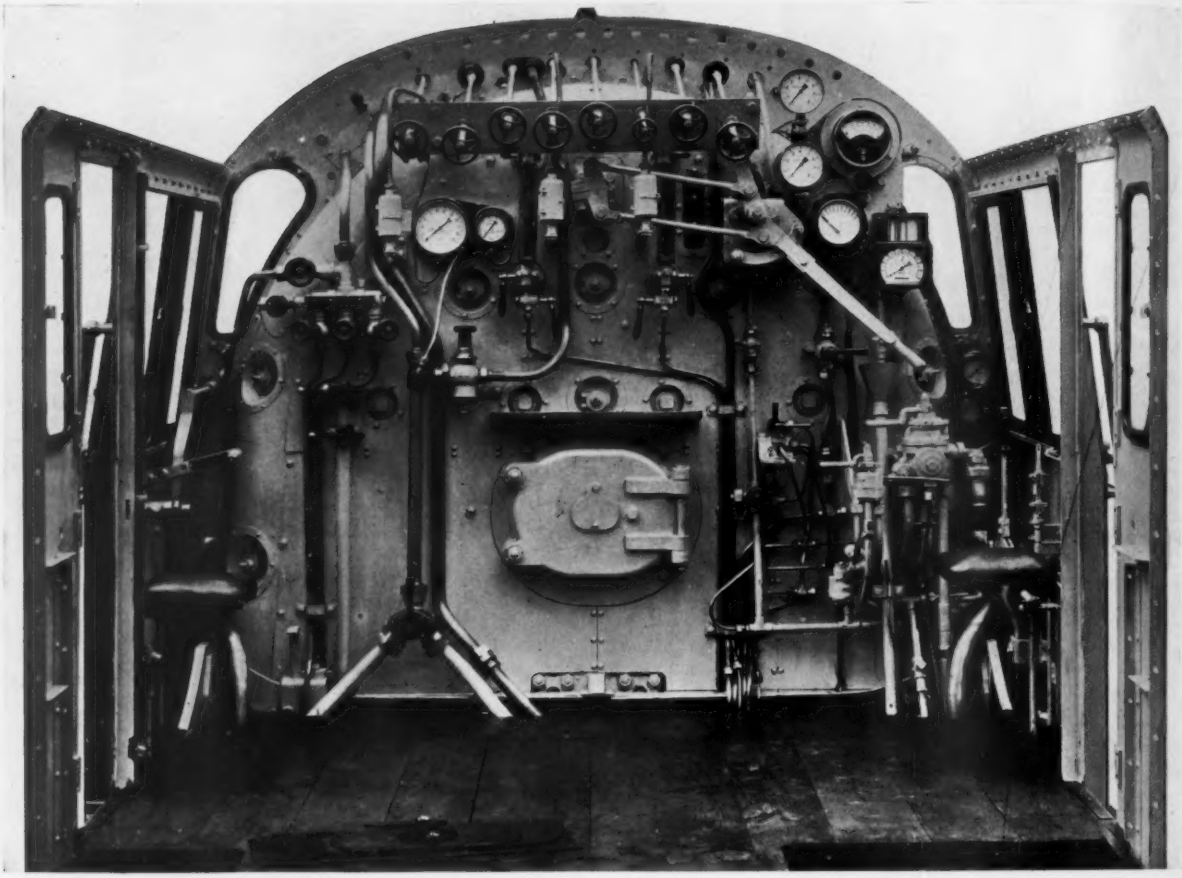
General view of the new engine. Its massive proportions are here well displayed





Left: separate view of boiler and smokebox. Right: outer firebox and boiler barrel during construction

NEW 4-8-2 + 2-8-4 BEYER-GARRATT LOCOMOTIVE FOR IRAN



Interior of cab, showing arrangement of controls and other fittings

namely the outer coupled and intermediate, and the driving inner coupled and inner bogie, the inner bogie being fitted with a radial arm. The driving and intermediate wheel tyres have thin flanges. The Walschaert valve gear is operated by steam reversing gear fitted with locking cylinder. The piston valves each have four rings, and are arranged for inside admission. The pistons are of cast steel, fitted with three rings and tail rods. Cylinder lubrication is by Wakefield mechanical lubricators, one on each unit, which also feed the high pressure steam ball joints. The piston rods and tail rods are fitted with United Kingdom metallic packing.

The braking system comprises a Knorr-Bremse automatic and non-automatic air brake to all coupled wheels, also an auxiliary steam brake to all coupled wheels; there is a hand screw brake to the coupled wheels of the hind engine unit. Compressed air sanding of Gresham & Craven pattern is arranged at the front and rear of each group of coupled wheels, also at the front of the driving wheels of the forward engine unit and to the rear of the driving wheels of the hind engine unit.

The illustration of the cab clearly indicates the various fittings and their location, which has been carefully considered; the cab is of exceptional size and well ventilated. The enginemen are provided with upholstered seats, the driver being on the right hand side, where the regulator handle with locking catch, brake apparatus and reversing gear are well arranged to suit his convenience. On the fireman's side the controls for operating the oil burning apparatus are placed easy to hand, also the boiler pressure gauge. Water gauges are of the Klinger reflex pattern. The gauges on the driver's side above the reversing lever indicate steam chest pressure in the front and hind engine respectively.

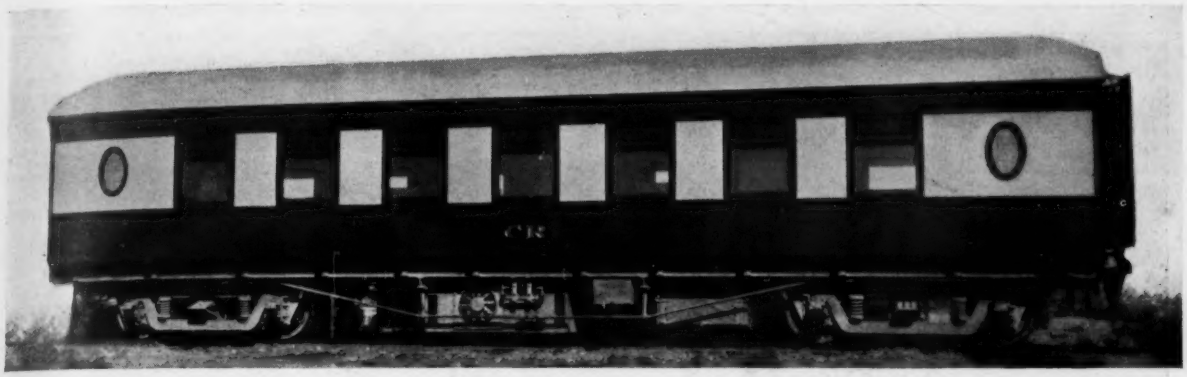
Other fittings include a Foster pyrometer and a Teloc recording speed indicator. The various controls are marked in Iranian script. Westinghouse steam train heating is also provided. A Latowski bell fitted ahead of the chimney is operated by compressed air. The locomotive, as will be seen, has side buffers and cowcatchers. As already stated, the engine is arranged for oil fuel, the burner being fitted at the front of the firebox.

The four locomotives have now been shipped from the manufacturers' works via the Black Sea, Batum, and Baku, and will be erected at Bandar Shah practically on the shores of the Caspian Sea. In due course we hope to make reference to the performance of these most interesting engines.

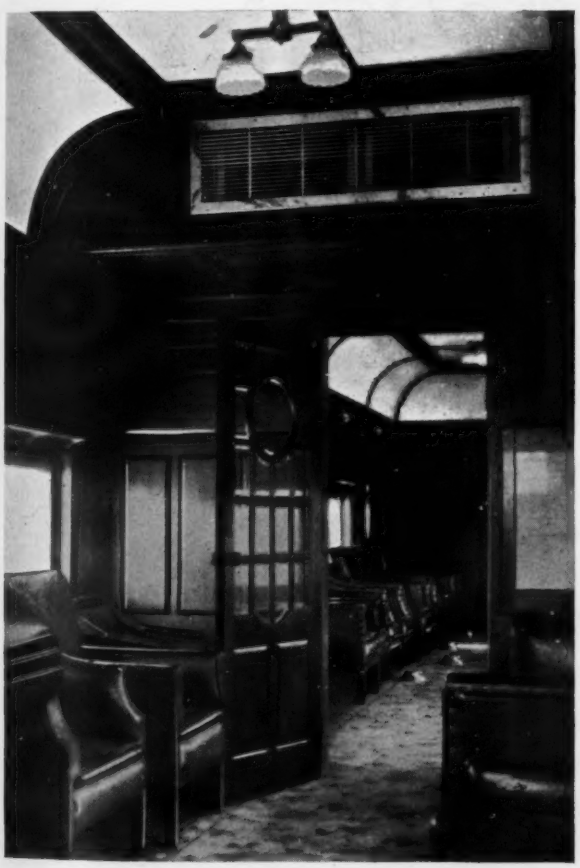
L.N.E.R. Colliery Map. — The Advertising Manager, L.N.E.R., has just issued a map giving particulars of collieries in Yorkshire, Nottinghamshire, Derbyshire, Lancashire, Cheshire, and North Wales to which the L.N.E.R. has access, indicating their position in relation to that company's lines. In order to throw up the names of the collieries and thus make them more legible, the railway lines have been printed in a soft grey instead of a dead black. The map has been issued in two forms, (1) mounted on linen in folded form, and (2) with rollers top and bottom for wall hanging. Copies have been distributed to selected firms associated with the coal industry.

AIR-CONDITIONED CAR FOR TRANS-AUSTRALIAN RAILWAY

A brief description of the type of car selected for the 1,050-mile desert section of the Trans-Australian line of the Commonwealth Railways system



IN our Overseas columns we have several times referred to air-conditioning in Australia, notably on March 13, when we alluded to the first air-conditioned car in the Empire, on the Victorian Government Railways, and in our issue of June 12, when we referred to the experimental car and the future equipment of all lounge and dining cars on the Port Augusta-Kalgoorlie section, or Trans-Australian Railway, operated by the administration of the Commonwealth Railways. Moreover, on April 3 we published an illustrated article upon the Victorian Railways air-conditioning system.



End of non-smoking compartment, looking into smoking compartment. Note grill over door

The equipment on the Trans-Australian line is similar to the latter with the exception of the following details:—

(1) There is a direct drive from the gearbox to the generator.

(2) The air-conditioning unit is situated in the centre of the length of the car in the roof. It is constructed in one framework and is divided into two separate sections, each containing a cooling coil, heating elements, and two air-circulating fans. The air-circulating fans are driven from one common motor, which is mounted on anti-vibration supports.

(3) The coach has two compartments, smoking and non-smoking, and each section of the air-conditioning unit mentioned above serves one of these compartments. By this arrangement the air in both is kept entirely separate. The temperature in each compartment is controlled individually by thermostats, the controls of which are centralised on a main control panel.

(4) The air is discharged into each compartment through a decorative grille, adjacent to the unit, circulates throughout the compartment, and some of it is returned to the unit through another decorative grille beneath the unit.

On the long 1,050-mile run that these coaches will make across what is mainly waterless desert liable to sand or dust storms, the value of air-conditioning should be specially great, and with the exception of North Africa and parts of India, there are probably few places that cry out so loudly for this modern travel amenity.

We are indebted to J. Stone & Co. Ltd., the firm which has supplied these various air-conditioning equipments, for this information.

FOREIGN VISITORS TO GREAT BRITAIN.—Figures recently issued by the Home Office show that the total of foreign visitors to Britain in July was 66,313, an increase of 11,951 over July last year. The Travel and Industrial Development Association announces that this is a record figure, and that the unofficial figures already recorded for August indicate that the present holiday season will surpass previous records by a considerable margin. Visitors from the U.S.A. numbered 22,524, an increase of 5,633 over July in Silver Jubilee year. Next come visitors from France who, excluding the numerous class of week-end and day excursionists, totalled 15,500, an increase of 1,853 over July of last year. Proportionally there has been a striking increase in the number of Dutch visitors, who totalled 5,308, an increase of 1,086. The German figure is 6,140, an increase of 1,391.

UP-TO-DATE JOINERS' SHOP, L.N.E.R.

The joiners' shop equipment of the Park Lane shops, Gateshead, of the L.N.E.R. (North Eastern Area) Engineer's Department, has recently been modernised

A VERY complete modernisation of equipment has recently been carried out in the joiners' shop at the Newcastle District Engineer's Park Lane shops, Gateshead. The scheme as a whole involved the scrapping of an obsolete "general joiner," the provision of independent drive to other existing machines in lieu of shaft and belt drive, and the installation of a number of new machines of modern type. The full equipment consists of a 32-in. circular saw; 42-in. band saw; three surfacing and thicknessing machines—24-in., 20-in. and 9-in.; chain mortising machine; vertical spindle moulder; 24-in. by 6-in. tenoning machine; and 6-in. open end belt sander.

Adjacent to the joiners' shop there is a well equipped sawmill which deals principally with timber not requiring further fabrication. The machinery in this mill consists of a 54-in. saw with 45-ft. travelling table; 32-in. circular saw; 18-in. cross cutting and trenching machine; and 24-in. surfacing and thicknessing machine; all fitted with independent motor drive. The new machines are the product of Wadkin & Co. Ltd., of Leicester, and were selected and obtained by the Chief Mechanical Engineer.

These pleasantly light and congenial shops, the roofs of which are of a very simple welded construction, are illustrated herewith and are symptomatic of all the accommodation provided at Park Lane. The shops are also well ventilated, and warmed in winter. Mr. H. Hills is the District Engineer, and has been responsible under Mr. John Miller, Engineer, North Eastern Area, L.N.E.R., for the modernisation.

Machinery side of joiners' shop

THE REXALL TRAIN

The United Drug Company of America has recently chartered a special streamlined train from the New York Central Railroad to help promote the sale of Rexall products

THE United Drug Company, which operates in the United States and Canada through about 10,000 chain stores under the name of Louis K. Liggett, recently chartered a special streamlined train which is at present making an extended tour of the North American continent. The purpose of the train, for which the trade name Rexall has been adopted, is to enable the United Drug Company to make contact with the druggists of its scattered stores in a rather different way from the more usual convention meeting. In addition, although it was not originally appreciated, the train has proved itself to have considerable publicity value, as may be realised from the fact that over 1,100,000 persons visited it during the first four and a half months of its tour. When the train first set out from Boston on March 28 last it was the intention of the United Drug Company that the exhibition should be visited only by druggists and their friends, and it was only later, when it was realised to what extent general interest had been aroused, that the decision was made to permit inspection by the public as well.

The Rexall streamlined train built by the New York Central Railroad

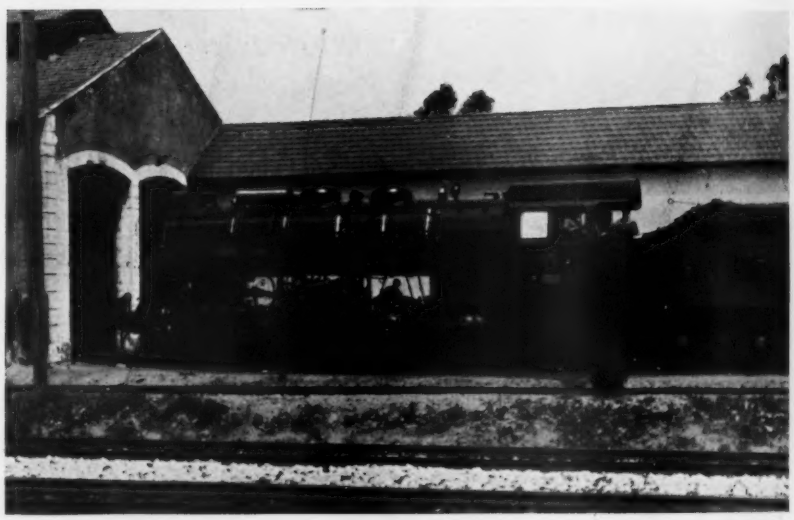
The train, which has been leased from the New York Central Railroad, consists of a 4-8-2 oil-burning streamlined locomotive, built specially for the purpose, and twelve streamlined coaches. This locomotive is hauling the train throughout its entire journey of 29,000 miles, in the course of which 52 different railroads are being traversed. This, of course, has necessitated particular care in design, as the loading and track limitations of all 52 railroads had to be taken into consideration. A locomotive foreman of the New York Central is accompanying the locomotive throughout the tour, but local engine crews take charge of the train on the different systems.

Each of the twelve cars comprising the train bears the trade name of some United Drug Company product, such as Klenzo. The cars are of standard design and, like the locomotive, are finished in royal blue and white, the trade colours of the company. The name of the New York Central System appears only on the tender and the front of the locomotive. The equipment provided in the train provides almost everything which would be found at a hotel convention. There are even three telephones which may be connected up to city lines at each stop, and a teletyper installation which can be similarly connected with the company's head office in Boston to facilitate interchange of office business. The train crew of fifty men, which includes a four-man orchestra, is housed in the second car of the train, the first containing luggage compartments, air-conditioning machinery, and a generating plant for the indirect lighting system. The next four cars are all fitted up for exhibition purposes, one being a model drug store, the second presenting various aspects of scientific research, and the third and fourth a display of the company's many products. Next come two lecture cars, specially arranged to seat 250 people. Then there is a buffet car, followed by a lounge and a special sleeping car providing accommodation for the officials of the company travelling with the train. The last car is the private car of Mr. Louis K. Liggett, President of the company.

Beira-Alta Railway, Portugal, and its latest (4-8-0 type) locomotives

(*See Overseas paragraph on page* 366)

Above: Express hauled by older type of locomotive, picking up train staff as it runs through Travagem station



Right: Latest type of locomotive, built by Henschel & Sohn in 1930, *standing outside Pampilhosa running shed*

Left: One of the 4-8-0 *engines at Pampilhosa with staff engaged in wiping it down. Premiums are awarded monthly for the best kept locomotive*

RAILWAY NEWS SECTION

PERSONAL

Mr. R. M. T. Richards, Development Officer, General Manager's office, Southern Railway, sails today, September 4, by the *Windsor Castle* for South Africa to make a tour of the fruit-producing areas. He expects to be returning to London about the middle of December.

Mr. J. H. Laundy, who, as announced in THE RAILWAY GAZETTE of August 21, has been appointed to succeed Mr. J. S. Wilson as Assistant

Mr. J. H. Laundy,
Appointed Assistant Audit Accountant, Southern Railway

Audit Accountant, Southern Railway, was born in 1886. In 1901 he entered the service of the former London & North Western Railway as a junior clerk in the Audit office at Euston. At the invitation of the former London Brighton & South Coast Railway, he was transferred to the Accountant's office at London Bridge, in 1915, as Chief of the Coaching Audit Section and Chief Fares Clerk. During the succeeding eight years he represented the L.B.S.C.R. on fares matters at the Passenger Traffic Rates & Fares Conference at the Railway Clearing House. In 1923 Mr. Laundy was appointed Assistant Head of the Coaching Division of the Audit Accountants' office, Southern Railway, and was promoted to be Chief Clerk in July, 1930.

Mr. H. J. Allcock, M.Sc., of Callender's Cable & Construction Co. Ltd., is to attend the Third World Power Conference and will sail for New York in the *Queen Mary*.

Mr. W. C. Guilding, Chief Storekeeper, Central Railway of Peru, has arrived in this country on leave.

Mr. Harvey Ward, Manager of the Victoria Falls Hotel, has retired after 28 years' service with the Rhodesia Railways.

Mr. W. R. Major, O. B. E., M.I.Loco.E., formerly Chief Mechanical Engineer of the Central Railway of Peru, and who has also served on the Dorada, United Railways of Havana, San Paulo, and Central Argentine Railways, has accepted an appointment as Locomotive Engineer on the Iranian State Railways.

SOUTHERN AFRICA TRANSPORT CONFERENCE

The following is a further list of delegates who will attend the Southern Africa Transport Conference which opens in Johannesburg on September 14 (see our Overseas columns of August 7, page 217):—

Angola: The Governor, H.E. Col. Lopes Matens; Capt. Victor Maropies, Chief of the Cabinet; First Lt. America Cabral; Lt. Gonsolves Cainbra.

Belgian Congo: The Governor will be represented by Mr. Jean de Debroey.

Mozambique: Major Teixera and Mrs. Jose Ferreira.

Madagascar: Mr. Costa Rramone, Chief Engineer of Public Works, and Capt. Assolloart, Chief Pilot of Airways.

Native Territories: Advisers to the High Commissioner in the Native Territories will be Col. C. F. Rey, Resident Commissioner of Bechuanaland; and Mr. W. G. Brind, Government Engineer.

Beira and Mashonaland and Rhodesia Railways: Mr. G. Chapman, General Manager.

Kenya and Uganda Railways: Brig.-Gen. Sir Godfrey Rhodes, C.B.E., D.S.O., accompanied by Mr. A. G. Higgins, Assistant Superintendent.

Tanganyika Railways: Mr. R. E. Robins, O.B.E., General Manager.

Benguella Railway: Sr. Goncalo Cabral, Representative of the company in Africa and General Manager.

Loanda State Railways: Sr. Sande Lemos, General Manager.

Chemin de Fer du Katanga: Monsieur M. Coestier, Commercial Superintendent.

Great Lakes: Mr. M. Van Loock, Engineer Manager.

The Rhodesia Railway Commission will be represented by Mr. F. H. Lowe, Mr. Shirley Eales, Mr. R. D. Gilchrist, and Mr. J. S. H. Grant.

It is with regret that we have to announce the death of Mr. S. R. Hibbert, Goods Manager, Egyptian State Railways, which occurred in the Anglo-Swiss Hospital at Alexandria on August 17, after a short illness. Mr. Hibbert, who was 55 years of age, joined the service of the Egyptian State Railways in 1904 as Clerical Assistant to the Divisional Traffic Superintendent, Lower Egypt, Tanta. In 1906 he was transferred to Gabbary as Assistant General Traffic Superintendent, and in 1915 he was promoted to the post of Divisional Traffic Superintendent, Helwan Line. During the war, Mr. Hibbert was entrusted with the control of the Canal zone, and in 1919 was promoted to the post of General Traffic Superintendent, Gabbary. It was on May 1, 1930, that he was appointed Goods Manager, the post he held up to the time of his death.

Mr. J. G. Symes, F.S.I., who, as announced in our issue of August 21, has been appointed Assistant Estate Agent, Southern Railway, was educated at King's College School, and entered the service of the former South

Mr. J. G. Symes, F.S.I.,
Appointed Assistant Estate Agent, Southern Railway

Eastern & Chatham Railway in 1894, as a draughtsman in the Estate Department. After gaining valuable and varied experience in that position, he was promoted to be Technical Assistant in the same office. In 1933, when the amalgamation of the divisional estate offices took place, Mr. Symes became Chief Technical Assistant, the post he has recently vacated on promotion to Assistant Estate Agent. He is a Member of the Surveyors' Institution.

The Rt. Hon. Lord Invernairn of Strathnairn, late Chairman and Managing Director of William Beardmore & Co. Ltd., left personal estate valued at £858,092 (£91,087 net).

From the *London Gazette* of August 25: Territorial Army, Royal Engineers; Engineer & Railway Staff Corps: Messrs. Archibald Hugh McMurdo, M.B.E., M.Inst.C.E.; Francis Mathew Fuller, A.M.Inst.C.E.; and Duncan Law Anderson, A.M.Inst.C.E., late Lt., R.E., T.A.; to be Majors (August 26).

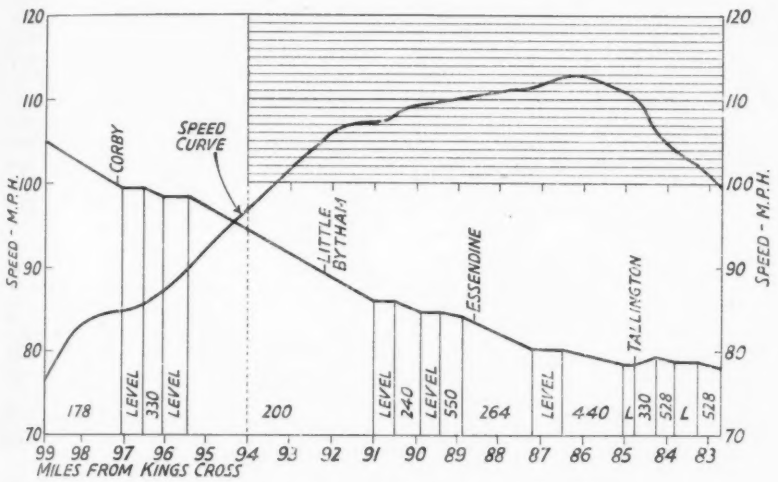
The down Silver Jubilee express passing over Welwyn viaduct, L.N.E.R., headed by streamlined 4-6-2 locomotive No. 2509, "Silver Link"

The Swedish State Railways were among the first to introduce third class sleeping cars. The original vehicles, with three superposed berths on each side, began service in 1910 between Stockholm and Gothenburg (284 miles), shortly after the similar Norwegian Christiania (Oslo) and Bergen services. In 1912 the Stockholm-Lulea service (731 miles) was introduced and in 1913 a service between Stockholm and Malmo was advertised, when the decline in the use of these carriages led the Administration to withdraw them. More comfortable stock with 15 three-berth (instead of 8 six-berth) compartments, i.e. a total of 45 only (instead of 48) were provided and have proved successful. The latest type of stock is shown above, arranged respectively for day and night use (see also editorial note on page 358)

Another British Speed Record

The Silver Jubilee attains 113 m.p.h. down, and maintains an average of 82.6 m.p.h. up, the same gradient on the same day in the course of test journeys with a dynamometer car

For the first time since the inauguration by the London & North Eastern Railway of the Silver Jubilee service, tests were made on Thursday, August 27, with the dynamometer car, both from Newcastle to King's Cross and from King's Cross to Newcastle. The addition of this 34½-ton vehicle raised the tare weight of the train to 254 tons, and the gross weight, with passengers and luggage, to 270 tons. The occasion was made memorable by the speeds run in both directions over strips, a further lengthening of the engine cut-off caused the speed to rise until a maximum of 113 m.p.h. was reached and maintained for a distance of nearly 1,000 yd., in the vicinity of mile-post 86. It was at about the 93½ mile-post that speed first touched 100 m.p.h., and it remained above the 100 level until the 82¾ mile-post, where it was rapidly falling in preparation for the slack over Werrington water-troughs, which begin near mile-post 80. From mile-post 97½ to mile-post 81 the 16½ miles took 9 min. 53 sec., with an average of 100·2 m.p.h.; from mile-post 91½ to mile-post 84½ seven miles were run in 3 min. 48·8 sec., at an average of 110·1 m.p.h. So far as published and authenticated records are available, the maximum of 113 m.p.h. is the highest that has yet been attained by a steam locomotive anywhere with so heavy a load as 270 tons behind the tender. Although the Silver Jubilee has also on several occasions reached 100 m.p.h. in ordinary service when timekeeping has made it necessary, the 113 m.p.h. of this journey is by far the highest speed yet touched by any express in this country conveying ordinary passengers. On arrival some of the passengers in the train remarked that although they realised that the train was travelling very fast at the time—actually lunch was being served when the maximum speed was attained—they had no idea that the performance was anything out of the ordinary, a fact which speaks well for the maintenance of the track and the rolling stock.



L.N.E.R. up Silver Jubilee, August 27, 1936

Engine No. 2512, *Silver Fox*. Load, 8 vehicles, 254 tons tare, 270 tons gross

the lengthy incline between Stoke summit and Tallington, on the Grantham-Peterborough section of the route. On the up journey the engine *Silver Fox* attained the unprecedented maximum speed, for Great Britain, of 113 m.p.h., and on the down journey the engine *Silver Link* maintained the remarkable average speed, with this load, of 82·6 m.p.h. throughout up the 15·3 miles from Tallington to Stoke summit.

A diagram is reproduced herewith, compiled from a timing by Mr. Cecil J. Allen, showing the speed of the up express between the 99th and the 83rd mile-posts. From this it will be seen that the record maximum was not attained at the point where 100 m.p.h. was reached by the 4-6-2 engine *Flying Scotsman* in the test run of November 30, 1934, and 108 m.p.h. by the engine *Papyrus* on the test journey of March 5, 1935, namely at or near the foot of the 4½ miles of 1 in 200 terminating at mile-post 91. On the run of August 27, speed was fairly steady at about 107 m.p.h. here; but despite the fact that the gradient beyond this point eases considerably, and includes some level

On the return journey, as already mentioned, the almost equally remarkable feat was performed of averaging 82·6 m.p.h. throughout up the practically continuous incline of 15·3 miles from Tallington to Stoke summit, and a notable feature of this performance was that a cut-off of 18 per cent. sufficed for its achievement. The regulator was kept fully open, and with these engines the size of the steam passages is so ample that with a fully-opened regulator the difference between the boiler pressure and that in the steam-chest is negligible, rarely exceeding 5 lb., so that on this climb the steam-chest pressure remained continuously at 230 to 240 lb., with the boiler finding ample steam for all requirements. Notwithstanding a most scrupulous observance of all service slacks, which resulted in speed reductions to 68 m.p.h. at Offord, 23½ at Peterborough, 63 at Grantham, 69 at Muskham water-troughs (Newark), 71 at Retford, 66 at Scrooby troughs, 66 at Doncaster, and 69 over Shaftholme junction, the 160·3 miles from Potter's Bar to Brayton junction, Selby, were covered in 124 min. 36 sec., at an average speed of 77·2 m.p.h. throughout. Furthermore, by way of contrast with the up journey, speed on the down journey was not allowed to exceed 92 m.p.h., and the performance was therefore made possible chiefly by the outstanding uphill work of the locomotive, and the extremely rapid recovery from every speed reduction. The minimum speeds were 73 m.p.h. at Woolmer Green, 74 at mile-post 62 (Stukeley bank), 75 at Stoke summit, and 75 at Markham summit. Through Selby and York the usual severe speed restrictions were made, and north of York the overriding 70 m.p.h. restriction was observed, but Darlington, 232·3 miles from King's Cross, was reached in 194 min. 43 sec., 3¼ min. early. The time from London to Newcastle was 3 hr. 55 min. 58 sec., or 4 min. less than the scheduled 4 hr., despite an increase of 15 per cent. in the customary weight of the train.

Forthcoming Events

Sept. 7–12.—World Power Conference, at Washington, U.S.A.

Sept. 8 (*Tues.*).—Permanent Way Institution (Sheffield), at Royal Victoria Hotel, 7 p.m. "The Maintenance of Electric Track Equipment and Safety Working," by Mr. R. Knotts.

Sept. 9–16.—British Association, at Blackpool. Annual Meeting.

Sept. 10 (*Thurs.*).—Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, London, E.C.4, 7.30. p.m. "Railway-Owned Omnibus Services," by Mr. Charles E. Lee.

Sept. 14–18.—Institute of Metals, at Paris. Autumn Meeting.

Sept. 17–26.—"Model Engineer" Exhibition, at Royal Horticultural Hall, Vincent Square, London, S.W.1.

Sept. 19–23.—Commercial Motor Users' Association, at Brighton. National Road Transport Conference.

Sept. 26 (*Sat.*).—Permanent Way Institution (Manchester-Liverpool). Visit to Blackpool Corporation Gas Works.

The Railway Plan as a Component of the Regional Plan

Railway communications are a public facility that must necessarily be considered in schemes of town and regional planning, but the fact that they were established in an age of haphazard municipal development often resulted in what has been described as "a mess that it remains for our generation to resolve by specialising each line and station in the traffic for which it is best fitted." The words are those of Mr. Roy V. Hughes, A.M.Inst.C.E., who recently read a paper on the subject to the Town Planning Institute.

Mr. Hughes was here speaking of the existing railway situation in Glasgow. He continued to show that co-ordinated town and railway planning in the construction of new lines to serve developing districts would avoid awkward intersections, facilitate final and amicable agreement as to the levels of road and railway at these intersections, and ensure that where road and rail run roughly parallel, the intervening land would not be of a shape and size unsuitable for economic development. It was a growing social necessity that railway construction costs in urban areas should be kept low, and with them the fares charged to daily travellers for whom, as a result of rehousing under regional planning schemes, a rail journey to and from work became necessary.

The principles of railway planning should be based upon the requirements of four main classes of traffic, as follows:—

1. Long-distance passenger (or "national expresses"), say over about 50 miles;
2. Regional passenger, including suburban;
3. Long-distance freight, with which may be grouped minerals conveyed in bulk;
4. Freight "trips" between yards, depots and industrial spurs.

It would not be practicable for every class to be dealt with at its own station, but specialisation of this kind would increase with the importance of the region.

Long-distance passenger stations should be sited just outside the commercial area, preferably at the centre of several radiating main streets, one of which, possibly a straight avenue, could link it, and bring it into relation with, the civic buildings of the town. Regional stations (suburban services) should be grouped so that no part of the commercial area was over ⅜-mile from one of them, giving convenient services or connections to all suburbs. In the suburbs themselves, thickly-populated dormitory areas should all have a station giving direct communication to the centre of the town, within ¾-mile. One of the regional stations in the town should be contiguous to the long-distance station, and intimate connection with trams and buses was desirable for them all. If electric traction was used, they could be situated underground, beneath streets, buildings, or parks.

Goods Stations

Long-distance freight terminals, with their associated noise, required to be kept outside the areas where development existed or was expected. Their size should be such as to give a maximum flow of wagons for sorting of 100 an hour—a convenient humping speed. A number of yards might be necessary in busy regions, but each could deal with the traffic of several routes. Local freight traffic (class 4), that is, the flow to and from the long-distance terminals, required various types of station to accommodate it. First there was the transhipment, warehousing, and sorting depot, one of which would normally suffice for towns up to about a million of population. The site should be an elongated pentagon linked by rail with the marshalling yard and the main line, the latter for the many freight trains running direct to and from the depot. Ideally, the site should be in close communication with the inner ring road of the town, for the convenience of the heavy road traffic to all parts of the delivery area.

After outlining the desiderata of rail facilities for wholesale and livestock markets, and for coal, building materials and low-grade agricultural traffic unloaded by consignees, Mr. Hughes referred to the growing tendency for milk to be sent direct in bulk to the private sidings of distributive organisations. As every junction with a private siding meant a ground frame or signal box, expensive to construct and maintain, he advocated the grouping of factories requiring rail connection in estates. Such estates should be connected with the marshalling yards by branch lines for freight traffic only. The layout suggested for the estates was a parallel grid with alternate lines of roadway and three-track railway, and the size of the "mesh" could be varied to give developers a choice of building depths.

Built-up Areas

The passage of railway lines through built-up areas, at present usually in the form of a viaduct bounded by back yards, or of a cutting bounded by retaining walls and more back yards, should preferably be underground, and railway and municipal authorities might co-operate in buying a strip of land of sufficient width for a pleasant boulevard to be laid out following the course of the tunnel. Where construction had to be at or above ground level, a "buffer zone" should be kept at each side of the railway, the houses beyond facing towards instead of away from the line. The favourable impression thus made upon visitors by train was described by Mr. Hughes as "good civics." Before leaving this aspect of the subject, he referred to the successful experiments in beautifying spare land beside the railway which have been carried out in the North Eastern Area of the L.N.E.R.

Of underground railways, Mr. Hughes suggested that a useful development in London would be the construction of fast lines roughly parallel with the existing system, to which outer suburban traffic could be transferred and run non-stop to the central area from a point about seven miles out. This was already a feature of suburban working on the French State Railways.

Before illustrating with lantern slides the features of some notable railway plans which have already been, or are being, realised, the author discussed the piecing together of the railway plan he had described. Where the main passenger station was of the through type, little obstruction was caused to town planning if the approach lines were at a low level. Birmingham (New Street), for example, fitted neatly into the central area of the city, and one of the tunnels passed right under the site of the proposed civic centre. The author showed a slide of a suggested railway plan, a feature of which was that only one main line traversed the centre of the city. The junctions at which the different classes of traffic were segregated were gathered into compact groups outside the built-up area, as were the marshalling yards associated with the goods belt line. An airport was also shown, adjoining one of the passenger stations as at Gatwick (Southern Railway).

RAILWAYS A.A. CHAMPIONSHIPS.—The Railways Athletic Association annual flat championships and sports were held at Wolverton on Saturday, August 22, by kind permission of the Wolverton A.C. In perfect weather some fine performances were witnessed by an enthusiastic assembly, which included Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R., and a number of other railway officers. B. E. Sales, Met. Line (L.P.T.B.) A.A., retained the 100 yds. and furlong titles. The holder of the mile championship, W. A. Struthers (L.N.E.R., Glasgow A.C.), was beaten into third place by H. W. Clark (L.N.E.R., York) and C. C. Baldwin (Swindon A.C.). A. J. Collyer (L.M.S.R., A.C.) won the half-mile championship, and T. W. Richardson (L.M.S.R. A.C.) became the new two miles walking champion. The one-mile medley relay championship was won by L.M.S.R. A.C., and the three-miles team race championship was won by Swindon A.C., W. Townsend (Swindon A.C.) being first home. In the ladies' section, B. M. C. Proctor (L.M.S.R. A.C.) won the 100 yds. flat championship. Mrs. Stanier presented the prizes at the conclusion of the meeting, for which service she was thanked by Mr. Gerald Yorke, Chairman of the R.A.A.

Census of Railway Employees

As noted in our editorial columns, a return has been issued showing (i) the number of staff employed by the railway companies of Great Britain, the Railway Clearing House, and on the railway undertakings of the London Passenger Transport Board during the week ended March 7, 1936, and (ii) a comparison of the rates of pay and average weekly salary or wage of, and average weekly payments to, certain selected grades during the weeks ended March 7, 1936, and March 9, 1935.

Details are given of the number employed in each of the principal grades by the four amalgamated companies, certain committees, London Transport, and the Clearing House, with totals for each undertaking and for Great Britain. Male and female employees are shown separately, and, with the exception of staff not employed directly, *e.g.* staff employed by contractors, all persons in the service of the railway undertakings mentioned during the week of the census are taken into account. The figures represent the numbers of staff receiving salaries or wages for the full week combined with the equivalent number of full-time workers in cases where employees were paid for less than the complete week.

The average payments to certain of the adult male staff were shown by the returns received to be as follows:—

	Week ended—March 7, 1936		Week ended—March 9, 1935	
Staff entered at salaried rates:—	s.	d.	s.	d.
Clerical, supervisory, &c., staff (exclusive of officers and of staff entered under ancillary businesses) ...	92	0	91	9
Staff entered at wages rates (excluding staff entered under ancillary businesses):—				
Conciliation staff ...	64	5	63	1
Shop and artisan staff	69	1	68	5

The average payments represent salaries or wages, residual bonus (if any), war wage, piecework payments, tonnage bonus, payments for overtime, Sunday duty, night duty, commuted allowance and any other payments for work performed, but exclude compensation allowance, travelling and out-of-pocket expenses, and meal and lodging allowances. The deductions operating by agreement as from March 28, 1931, were partially restored as from the first full pay following October 1, 1934, and a further partial restoration was made in January, 1935.

Summary of Total Staff Employed

Name of Company	At March 7, 1936	At March 9, 1935
G.W.R.	98,290	95,729
L.N.E.R.	171,798	171,339
L.M.S.R.	222,869	222,220
Southern	66,399	65,008
Cheshire Lines	4,022	4,072
London Transport ...	14,263	14,382
M. & G.N. Joint ...	2,026	2,049
Railway Clearing House	1,854	1,860
Other companies ...	4,090	4,107

The following table gives the numbers employed in each of the principal grades and in ancillary businesses during the selected week in 1936, with the corresponding numbers for the selected week in 1935:—

Male Staff	1936	1935
Railway Staff:—		
Capstanmen	1,187	1,220
Carters and vanguards	22,946	22,572
Carriage cleaners ...	6,372	6,375
Carriage and wagon examiners	4,240	4,232
Carriage and wagon oilers and greasers	1,805	1,833
Checkers	8,792	8,662
Cranemen	512	467
Crossing-keepers ...	1,322	1,308
Engine cleaners ...	6,742	8,285
Engine drivers and motormen	34,629	33,523
Firemen and assistant motormen	31,688	30,663
Foremen and chargemen	6,965	7,002
Guards—goods ...	13,583	13,535
Guards—passenger ...	7,517	7,307
Hydraulic and pumping engine staff ...	819	865
Labourers	25,185	24,029
Lampmen	1,806	1,816
Loaders, callers off, ropers and sheeters	5,566	5,532
Locomotive shed staff (excluding labourers)	8,806	8,877
Messengers	924	940
Number-takers ...	1,941	1,953
Officers and clerical staff...	62,823	62,818
Permanent-way men	55,129	55,017
Pointsmen	271	290
Police staff:—		
Supervisory grades	149	151
Other grades ...	2,150	2,164
Male Staff (continued):—		
Porters:—		
Goods	13,734	13,185
Passenger	23,982	23,809
Porter guards ...	541	560
Porter signalmen ...	2,126	2,134
Shop and Artisan Staff:—		
Supervisory grades	2,595	2,559
Other grades (excluding labourers and watchmen)	95,647	94,404
Shunters	16,625	16,341
Shunt-horse drivers ...	286	316
Signal and telegraph men	5,806	5,656
Signalmen	24,459	24,683
Signal box lads ...	1,504	1,547
Stationmasters, yardmasters, &c. ...	5,213	5,218
Supervisory staff (other than shop and artisan and police)	9,503	9,444
Technical staff ...	3,208	3,073
Ticket collectors ...	3,649	3,623
Traffic control staff ...	1,437	1,429
Watchmen	393	394
Miscellaneous grades	10,023	9,899
Railway total ...	534,600	529,710
Ancillary Businesses:—		
Canal staff	1,152	1,189
Dock and quay (other than shop and artisan) staff	11,551	11,755
Marine (other than shop and artisan) staff...	3,770	4,159
Marine and dock shop and artisan staff ...	3,404	3,596
Omnibus and passenger road vehicles:—		
Conciliation staff—traffic department	30	31
Hotel, refreshment room, dining car and laundry staff ...	7,636	7,593
Total—Ancillary businesses ...	27,543	28,323
Total — Male staff	562,143	558,033
Female Staff	1936	1935
Railway:—		
Carriage cleaners ...	599	574
Clerical and technical staff...	10,830	10,229
Crossing-keepers ...	1,509	1,484
Office cleaners and charwomen ...	2,747	2,725
Shop and artisan staff	1,116	1,105
Waiting room and lavatory attendants ...	543	546
Miscellaneous grades	453	430
Total	17,797	17,093
Ancillary Businesses:—		
Hotel, refreshment room, dining car and laundry staff ...	5,492	5,640
Marine staff	179	179
Total—Female staff	23,468	22,733
GRAND TOTAL—ALL STAFF	585,611	580,766

ARGENTINE CO-ORDINATION OF TRANSPORT BILL.—At a farewell luncheon in his honour, given by the British Chamber of Commerce in Buenos Aires on August 19, Mr. Ronald Leslie, the retiring General Manager of the Central Argentine Railway, strongly urged the passing of the Co-ordination of Transport Bill. He pointed out that the allegation that the railways were foreign while the road concerns were Argentine was not supported by the facts, as only 1 per cent. of railway employees were British and all capital was firmly embedded in Argentina. The suggestion of the road transport interests that the railways should be relieved of existing regulations and all forms of transport start off level was unacceptable. "It sounds very nice," he said, "but when you come to examine it, it is about equivalent to inviting a respectable dowager to join a nudist encampment."

Mr. Leslie concluded by demanding that local road transport should emerge from "a state of woad and feathers and don the garments of modern civilisation," states a Reuters message from Buenos Aires.

4,000-FOOT RAILS IN THE U.S.A.—Rails welded into lengths of 4,000 ft. have been laid in the Blossburg tunnel near Helena on the Northern Pacific Railway. According to the *Engineering News Record* for August 6, the rails were laid out in the bottom of 90 gondola cars for welding and delivery to the tunnel. Wagon axles supported in journal bearings bolted to the floors formed rollers over which the rails moved as they were drawn endways from the cars in the tunnel. A similar operation was recently completed in the Bozeman tunnel on the same railway.

NOTES AND NEWS

Argentine Government Grant for Railways.—A Reuters message from Buenos Aires states that a proposal to grant 44,000,000 pesos (about £2,500,000) for construction work on the Argentine railways was passed by the Senate on September 1.

Cardiff-Weston Air Ferry.—From August 21, Railway Air Services has been operating an hourly ferry service between Cardiff and Weston-super-Mare. The fares, which are 6s. 6d. single, and 9s. 6d. return, include road transport in each town. The flying time is 10 minutes in each direction.

London Bridge Station.—Among the works undertaken at London Bridge station, Southern Railway, recently, has been the removal of the 60-ft. turntable at the south end, and the provision of additional staircases on platforms 6, 7, 8, 9, and 10 to the foot-bridges connecting the high-level and low-level platforms.

Bekonscot Model Railway, Village, and Garden.—Up to the end of August, some 47,130 visitors have been received this year. In our issue of June 19 we recorded that the total attendance since the railway was first exhibited in 1932 had reached 98,796 by June 7. Last Sunday brought this figure up to 122,350.

Associated Locomotive Equipment Limited.—The new address of this company (formerly Lentz Patents Limited) is 66, Victoria Street, London, S.W.1. The telephone number is Victoria 7858, and the telegraphic address Caprovalve, Sowest, London. The directorate comprises Messrs. S. T. Gresham, C. E. New, E. C. Poultney, and F. J. Kuretschka.

New Polish Railway Opened.—A new line from Legjonowo to Tlueszcz (15 miles and 27 miles respectively from Warsaw) has, according to a Reuters message from Warsaw, just been opened. This line avoids Warsaw and connects the main Warsaw–Bialystok–Wilna and Bialystok–Baranowicze–Moscow lines with the main line from Warsaw to the north-west of Poland giving access to Torun, Dantzig, and Gdynia.

Italian Underground Stations as Air Raid Shelters.—It has been officially decreed, reports Reuters, that in future Italian underground tunnels and stations must be adequately protected against air bombing and must be capable of holding large numbers of people. In peace time the space thus provided can be used for garages, shops, or warehouse purposes. In the event of mobilisation these premises will be taken over immediately by the State. Adequate exits and ventilation shafts must be provided, and there must also be an independent air-generating plant. Air chambers are to be provided with locks. First-aid stations, sanitary accommodation, telephones, and lighting must also be installed. Most of the cost of providing these underground shelters must be borne by the companies themselves. Naples is the only Italian city which at present has an underground railway.

Santa Fé & Cordoba Railway Syndicate Limited.—Notice has been given, pursuant to Section 295 (5) of 19 & 20 George V, C. 23 (Companies Act, 1929), that the name of the Santa Fé & Cordoba Railway Syndicate Limited was, on September 1, struck off the register and the company dissolved.

Proposed Underground for Rio.—An invitation for tenders for the construction of an underground railway in Rio de Janeiro having met with no response, the city authorities are considering the offer of a group of American financiers to advance a sum equivalent to £10,000,000, subject to satisfactory guarantees. The proposed routes of the original scheme were from Morro do Castello, in the centre of the city, to the residential suburbs of Cascadura and Copacabana.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of July, 1936, amounted to $11,577,000, an increase of $447,000 in comparison with July, 1935. In the working expenses of $10,598,000 there was an increase of $994,000, leaving net earnings $547,000 lower, at $979,000. Aggregate gross earnings for the first seven months of 1936 were $73,621,000, an increase of $5,963,000, and the net earnings of $7,770,000 were higher by $182,000.

Canadian National Earnings.—For the month of July, 1936, gross earnings of the Canadian National Railways amounted to $15,296,295, an increase of $425,163 in comparison with July, 1935. Operating expenses ($15,209,092) advanced by $1,144,081 to leave net earnings of $87,203, which were $1,018,918 lower than for July, 1935. Aggregate gross earnings from January 1 to July 31, 1936, were $100,757,723, an improvement of $5,754,797, but the net earnings for the seven months were $711,414 lower, at $2,562,243.

Northern Ireland Traffics.—In April and May receipts from passenger train traffic (excluding parcels, mails, and miscellaneous) were slightly above the 1935 levels, totals of £21,183 and £19,220 for the two months, comparing with £20,440 and £19,122. The aggregate showed an improvement of £4,361 by the end of May. Railways partly in Northern Ireland have an improvement of £6,437 in passenger receipts for the five months. Goods train receipts on railways wholly in Northern Ireland were higher by £4,842 in April, reaching £21,146, and by £2,043 in May, when they totalled £18,801. For the five months they were £64,787, compared with £63,227 in 1935. On railways partly in Northern Ireland, however, an increase of £5,095 in goods receipts during April was followed by a falling off of £1,827 in May, but on the aggregate for five months the figures are still £15,435 better than last year.

G.W.R. Diesel Railcars in Winter Service.—The winter train service which the G.W.R. is bringing into force on Monday, September 28, includes the retention of practically all the services worked by the 17 A.E.C. streamlined diesel railcars. With the parcels car, they will cover 3,584 miles daily, against 1,235 in 1935. The service between Bristol and South Wales via the Severn tunnel will be augmented by one of these railcars, which will make four trips in each direction between Bristol and Cardiff, Mondays to Fridays inclusive. This will be the first regular streamlined railcar service through the Severn tunnel.

Completion of the Canton-Hankow Railway.—The formal opening of the complete line between Canton and Hankow took place on September 1, when the first through train left Hankow for Canton. The line has been completed by means of a loan secured on a portion of the British Boxer indemnity, remitted under the 1930 agreement, and by a further charge on the customs revenue. Our correspondent in China recently reported (see THE RAILWAY GAZETTE for August 28, p. 334) that two bridges which were damaged when this line was bombed during the Nanking-Kwangtung fighting had been repaired, and it was expected that through traffic would be inaugurated on October 10.

Polish Corridor Payments.—It is reported from Warsaw that an agreement between Germany and Poland was signed in Berlin on August 31 regulating until the end of the present year the payment of German railway transit indebtedness in respect of the Polish corridor. It is understood to be based on the provisional agreement which Herr von Moltke negotiated with the Polish Government at the end of March, when the Reichsbahn agreed to pay the equivalent of 3,200,000 zlotys (about £125,000) a month for railway transit across the corridor. This is less than half the monthly sum Germany was liable to have paid up to March 25, when the arrears on transit account were estimated at about £3,000,000. The service has since been reorganised to meet Germany's capacity to pay.

A "Railroad Wonder" Excursion.—In response to popular demand, the New York Central System has announced for September 20 a second "railroad wonder" trip, similar to that operated on November 17, 1935, to its West Albany (N.Y.) shops. This year's train will run from Weehawken, N.J., over the West Shore to Kingston, N.Y., and the Catskill Mountain branch to Oneonta, thence via the Delaware & Hudson through mountain scenery into Albany, and New York Central, Hudson division, to Grand Central terminal, New York. Ample time will be allowed for

railroad and scenic enthusiasts to take photographs. A display of locomotives of the New York Central and New York, Ontario & Western will be arranged in Weehawken station for an hour and a half prior to the departure of the train. At Oneonta the locomotive shops of the D. & H. will be inspected. The train will consist of coaches, a dining car serving table d'hôte meals at low prices, and a Pullman observation car. The Railway and Locomotive Historical Society, the Railroad Enthusiasts, Inc., and the International Engine Picture Club have co-operated with the New York Central and the Delaware & Hudson in planning this trip.

Siemens & Halske Bonds.—Guinness, Mahon & Company, of 53, Cornhill, London, E.C.3, has extended to September 30 the offer to purchase the Siemens & Halske A.G. Siemens-Schuckertwerke G.m.b.H. 10-year 7 per cent. secured sinking fund gold bonds due January 1, 1935, and the 7 per cent. secured sinking fund gold bonds due January 1, 1940. The terms and conditions (published on July 17, and originally expiring on August 31) are: (*a*) bonds due January 1, 1935, will be purchased at $1,020 for each $1,000 bond, and $510 for each $500 bond; (*b*) bonds due January 1, 1940, will be purchased at $1,000 for each $1,000 bond, and $500 for each $500 bond. All bonds tendered for sale must be delivered, on or before September 30, to Guinness, Mahon & Co., or to the Chemical Bank and Trust Company, 165, Broadway, New York.

Road Accidents.—The Ministry of Transport return for the week ended August 29 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding period of last year:—

	Killed, including deaths resulting from previous accidents		Injured	
England ...	124	(118)	4,728	(4,194)
Wales	9	(1)	204	(236)
Scotland ...	14	(5)	513	(376)
	147	(124)	5,445	(4,806)

The total fatalities for the previous week were 135, compared with 130 for the corresponding period of last year.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 35th Week			Totals to Date		
	1936	1935	Inc. or Dec.	1936	1935	Inc. or Dec.
L.M.S.R. (6,916¾ mls.)	£	£	£	£	£	£
Passenger-train traffic...	604,000	602,000	+ 2,000	17,712,000	17,456,000	+ 256,000
Merchandise, &c. ...	465,000	453,000	+ 12,000	16,385,000	15,461,000	+ 924,000
Coal and coke ...	239,000	227,000	+ 12,000	8,329,000	7,902,000	+ 427,000
Goods-train traffic ...	704,000	680,000	+ 24,000	24,714,000	23,363,000	+ 1,351,000
Total receipts	1,308,000	1,282,000	+ 26,000	42,426,000	40,819,000	+ 1,607,000
L.N.E.R. (6,332 mls.)						
Passenger-train traffic...	414,000	408,000	+ 6,000	11,499,000	11,365,000	+ 134,000
Merchandise, &c. ...	330,000	328,000	+ 2,000	11,150,000	10,737,000	+ 413,000
Coal and coke ...	230,000	222,000	+ 8,000	8,039,000	7,636,000	+ 403,000
Goods-train traffic ...	560,000	550,000	+ 10,000	19,189,000	18,373,000	+ 816,000
Total receipts	974,000	958,000	+ 16,000	30,688,000	29,738,000	+ 950,000
G.W.R. (3,746½ mls.)						
Passenger-train traffic...	281,000	273,000	+ 8,000	7,468,000	7,411,000	+ 57,000
Merchandise, &c. ...	191,000	187,000	+ 4,000	6,536,000	6,266,000	+ 270,000
Coal and coke ...	105,000	103,000	+ 2,000	3,483,000	3,419,000	+ 64,000
Goods-train traffic ...	296,000	290,000	+ 6,000	10,019,000	9,685,000	+ 334,000
Total receipts	577,000	563,000	+ 14,000	17,487,000	17,096,000	+ 391,000
S.R. (2,154 mls.)						
Passenger-train traffic...	406,000	393,000	+ 13,000	10,928,000	10,824,000	+ 104,000
Merchandise, &c. ...	67,000	69,500	− 2,500	2,155,500	2,140,000	+ 15,500
Coal and coke ...	32,000	37,500	− 5,500	1,079,500	1,028,000	+ 51,500
Goods-train traffic ...	99,000	107,000	− 8,000	3,235,000	3,168,000	+ 67,000
Total receipts	505,000	500,000	+ 5,000	14,163,000	13,992,000	+ 171,000
Liverpool Overhead ... (6½ mls.)	1,273	1,239	+ 34	41,994	41,819	+ 175
Mersey (4½ mls.) ...	3,800	3,759	+ 41	140,350	139,391	+ 959
*London Passenger Transport Board ...	555,100	524,500	+ 30,600	4,976,700	4,832,800	+ 143,900
IRELAND						
Belfast & C.D. pass. (80 mls.)	3,824	3,529	+ 295	93,130	93,085	+ 45
,, ,, goods	490	432	+ 58	19,029	17,423	+ 1,606
,, ,, total	4,314	3,961	+ 353	112,159	110,508	+ 1,651
†Great Northern pass. (543 mls.)	14,700	13,600	+ 1,100	372,800	360,700	+ 12,100
,, ,, goods	8,750	8,950	− 200	322,750	313,400	+ 9,350
,, ,, total	23,450	22,550	+ 900	695,550	674,100	+ 21,450
†Great Southern pass. (2,067 mls.)	50,468	47,484	+ 2,984	1,241,356	1,220,896	+ 20,460
,, ,, goods	40,054	32,876	+ 7,178	1,377,948	1,279,527	+ 98,421
,, ,, total	90,522	80,360	+ 10,162	2,619,304	2,500,423	+ 118,881

* 9th week. † 34th week.

British and Irish Railways Stocks and Shares

Stocks	Highest 1935	Lowest 1935	Prices Sept. 2, 1936	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	55½	44½	50½	+½
5% Con. Prefce. ...	124	108	120½	—
5% Red. Pref. (1950)	117	106¾	109½	—
4% Deb.	118½	108	115	—
4½% Deb.... ...	122	110	117½	—
4½% Deb.	129½	118	125	—
5% Deb.	140¼	130	136½	—
2½% Deb.... ...	82¼	68½	76	—
5% Rt. Charge ...	137	128	134½	—
5% Cons. Guar. ...	136¾	120½	131	—
L.M.S.R.				
Ord.	25 5/16	16	28	—
4% Prefce. (1923)	58¼	43½	77	—
4% Prefce. ...	87½	73½	87	—
5% Red. Pref. (1955)	107	97¾	106½	—
4% Deb.	110¼	99½	107	—
5% Red. Deb. (1952)	119 11/16	111 5/16	116½	—
4% Guar. ...	105⅝	95½	103½	—
L.N.E.R.				
5% Pref. Ord. ...	15⅞	8¼	13½	—
Def. Ord.	7 9/16	4¾	6¾	—
4% First Prefce.	74¾	48	75	—
4% Second Prefce.	31¾	16¼	30	—
5% Red. Pref. (1955)	92¼	71	96½	—
4% First Guar. ...	103 11/16	93	101	—
4% Second Guar.	98¾	82½	95	—
3% Deb.	86	75	82	—
4% Deb.	109¼	98½	106	—
5% Red. Deb. (1947)	118¼	106½	111½	—
4½% Sinking Fund Red. Deb.	112½	108	109	—
SOUTHERN				
Pref. Ord.... ...	87½	69⅜	92	—
Def. Ord.	25 13/16	16¾	23	—
5% Prefce. ...	124	108¼	120½	—
5% Red. Pref. (1964)	117¾	109½	116½	—
5% Guar. Prefce.	136½	121½	131½	—
5% Red. Guar. Pref. (1957)	121¼	112½	117½	—
4% Deb.	116¾	107	114	+½
5% Deb.	138	130¼	135½	—
4% Red. Deb. 1962-67	115	106½	111½	—
BELFAST & C.D.				
Ord.	9	4	5	—
FORTH BRIDGE				
4% Deb.	111¼	104¼	104½	—
4% Guar.	109⅞	104	104½	—
G. NORTHERN (IRELAND)				
Ord.	20	7	14⅜	—
G. SOUTHERN (IRELAND)				
Ord.	57½	14½	58	—
Prefce.	50	25¼	61	+1
Guar.	88¾	51¼	89¼	−½
Deb.	86¼	70	94	—
L.P.T.B.				
4½% "A" ...	130	119¾	122½	—
5% "A" ...	139¾	130	134½	—
4½% "T.F.A." ...	113¾	108	109	—
5% "B" ...	131½	122¾	128½	—
"C"	109½	91	106	—
MERSEY				
Ord.	23⅛	9¼	27	+1½
4% Perp. Deb. ...	100½	93½	99	+1
3% Perp. Deb. ...	75½	67	74½	—
3% Perp. Prefce.	62	47¼	64½	—

CONTRACTS AND TENDERS

Hurst Nelson & Co. Ltd. has received an order for 200 12-ton goods wagons for the L.M.S.R. These wagons were originally allocated to R. Y. Pickering & Co. Ltd., as was recorded on this page in our issue of August 7.

Railcars for South America

The Drewry Car Co. Ltd. has received orders from the Buenos Ayres Great Southern Railway for the supply of seven diesel railcars, seating approximately 40 passengers and fitted with Gardner 6LW engines, Vulcan-Sinclair fluid couplings and Wilson-Drewry epicyclic gearboxes. They are required for branch and local line services.

Railcars for Palestine

The Drewry Car Co. Ltd. has also received an order from the Crown Agents for the Colonies for five 30-b.h.p. petrol-engined inspection railcars for service on the Palestine Railways. These railcars will have Ford V8 engines and Wilson-Drewry epicyclic gearboxes. Three are for the 4 ft. 8½ in. gauge and the remaining two for the 105 cm. gauge.

The Hunslet Engine Co. Ltd. has received an order from the War Office for a Hunslet diesel-mechanical locomotive with all Hunslet patents. A Gardner 8L3 type 204 b.h.p. engine, and Hunslet clutch, pre-selective gear change and automatic control are to be fitted. The locomotive is to be built down to a total height of 9 ft. and is to be suitable for underground working which necessitates the latest Hunslet exhaust gas conditioner.

Hurst, Nelson & Co. Ltd. has received an order from the Crown Agents for the Colonies for one 30-ton bogie tank wagon, complete with wheels and axles and Vacuum brake gear, for the Palestine Railways.

The Bombay, Baroda & Central India Railway Administration has placed orders, to the inspection of Messrs. Rendel, Palmer & Tritton, with Frederick Braby & Co. Ltd. for 1,242 panel plates and with Bells Asbestos & Engineering Supplies Limited for 108 Salamander millboards.

The Chinese Government Purchasing Commission has placed the following orders for equipment required for the Canton-Hankow Railway to be supplied to the inspection of Messrs. Fox & Mayo :—

Brown Bayley's Steelworks Limited, draft-gear springs and bogie truck springs.

Steel Company of Scotland Limited, quantity of steel tyres for 40-ton wagons.

Wm. Beardmore & Co. Ltd., wheels and axles.

Callenders' Cable & Construction Co. Ltd., telephone and telegraph equipment.

The Gaekwar's Baroda State Railway Administration has placed orders to the inspection of Messrs. Rendel, Palmer & Tritton with the English Steel Corporation for 83 locomotive, carriage, and wagon axles and with Thos. Firth & John Brown Limited for 180 laminated springs.

Ashworth Ross & Co. Ltd. has received an order from the Government of Mysore for one metre-gauge 40-ton weighbridge.

Boilers for India

The Vulcan Foundry Co. Ltd. has received an order for four superheated boilers for G class locomotives, Bombay, Baroda & Central India Railway, to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

Electric Motor Coaches for S. Africa

The South African General Electric Co. Ltd. has received a further order, additional to the large order recorded in our issue of September 13, 1935, page 433, from the South African Railways & Harbours Board, for the supply of 18 electric motor coaches. The Metropolitan-Cammell Carriage & Wagon Co. Ltd. is to supply the coaches, which are similar to those this firm has already in hand, and the General Electric Company, of Schenectady, U.S.A., the electrical equipment. Nine of the coaches will be of type L-34-M, and nine of type S-38-M. Bristol Timken roller bearings will be used.

John Lang & Sons has received an order from the Assam-Bengal Railway for one 13-in. swing sliding surfacing and screwcutting lathe to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

The A.B.C. Coupler & Engineering Co. Ltd. has received an order from the Bhavnagar State Railway for 100 sets of MCA PH type buffers for metre-gauge wagons, to be supplied to the inspection of Messrs. Robert White & Partners.

Banting & Tresilian Limited has received an order for 21 copper firebox plates for the Bikaner State Railway, to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

Taylor Bros. & Co. Ltd. has received an order from the South Indian Railway Administration, to the inspection of Messrs. Robert White & Partners, for four locomotive steel axle forgings.

Burn & Co. Ltd. has received an order from the South Indian Railway for eight broad gauge steel four-wheeled goods brake vans on I.R.S. BVG type underframes complete with wood work but without wheels and axles.

R. & W. Hawthorn Leslie & Co. Ltd. has received an order for one locomotive boiler for a 2-8-0 locomotive, for the Peruvian Corporation.

Leyland Motors Limited has received the following orders from railway-associated road transport operators: East Kent Road Car Co. Ltd., five oil-engined Titans; Thames Valley Traction Co. Ltd., four oil-engined Beaver-Six vehicles; New South Wales Department of Road Transport, eight Titans; and Melbourne & Metropolitan Tramways Board, two Cubs.

The Bengal-Nagpur Railway Administration has placed orders with the West Bromwich Spring Co. Ltd. for 850 spiral springs and with the Tees Side Bridge & Engineering Co. Ltd. for 700 drawbars.

Stewarts and Lloyds Limited has received an order from the Egyptian State Railways Administration for galvanised pipes and fittings at a total approximate price of £1,898 f.o.b. Liverpool.

The Great Western Railway has authorised the following contracts :—

W. & A. Edgell Limited : Supply and erection of timber-framed warehouses at Minety and Axbridge stations.

Palmer's (Swansea) Dry Dock Co. Ltd. : Repairing and strengthening the west middle gate, King's Dock lock, Swansea.

Austin Lifts Limited : Supply and erection of two 30-cwt. electric luggage lifts, at Stourbridge Junction.

For Swindon Works

Carbic Limited : Automatic acetylene generating plant.

Canning & Co. Ltd. : Modernisation of oxidising and lacquering plant.

A. Herbert Limited : Vertical milling machine and combination turret lathe.

J. Lang & Sons Ltd. : Surfacing and boring lathe and a single-purpose centre sliding lathe.

Butler Machine Tool Company : 20-in. Shaping machine.

Kendall & Gent (1920) Limited : Vertical milling machine.

Middleton Bros. : Supply and erection of a 1¼-ton hoist block.

The Chief Controller of Stores, Indian Stores Department (Electrical Section), Simla, invites tenders, receivable by September 19, for an electrically-operated Goliath crane required for Saharanpur locomotive shed, North Western Railway of India.

Tenders are invited by the Chief Controller of Stores, Indian Stores Department (Engineering Section), Simla, receivable by September 22, for a number of lathes, and shaping drilling, and boring machines required for the North Western Railway of India.

The Chief Controller of Stores, Indian Stores Department (Engineering Section), Simla, invites tenders receivable by October 24 for the supply, on an annual rate contract basis, of ball and roller bearings during the period February 1, 1937, to January 31, 1938.

In order to extend its sales of oil engines, lighting plant, and agricultural equipment in Northern Ireland and the Irish Free State, R. A. Lister & Co. Ltd., of Dursley, Glos., has opened offices and technical service depots in both Dublin and Belfast. The addresses of the offices are, respectively, 44, South Dock Street, Dublin, and 40, Victoria Square, Belfast. Mr. Frank L. Price, A.M.I. Mech.E., who has been appointed Irish manager to the firm, for the past thirty years has been engineer representative throughout Ireland for Blackstone & Co. Ltd., with which Lister recently made a co-operation agreement.

OFFICIAL NOTICES

South Indian Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of :—

1. Steel Rails and Fishplates,
2. Tie Bars and Cotters,
3. Solid Drawn Steel Boiler Tubes,
4. Helical Springs.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company, Limited, marked "Tender for Steel Rails and Fishplates," or as the case may be, with the name of the firm tendering, must be left with the undersigned not later than 12 Noon on Friday, the 18th September, 1936.

The Directors do not bind themselves to accept the lowest or any tender.

A charge, which will not be returned, will be made of 10s. for each copy of Specification No. 1, and of 5s. for each copy of Specifications Nos. 2 and 3 and of 2s. 6d. for each copy of Specification No. 4.

Copies of the drawings may be obtained at the Offices of the Company's Consulting Engineers, Messrs. Robert White & Partners, 3, Victoria Street, Westminster, S.W.1.

E. A. S. BELL,
Managing Director.

91, Petty France,
Westminster, S.W.1.
2nd September, 1936.

University of London Commerce Degree Bureau

THE Official Institution of the University for the assistance of External Students preparing for the Commerce Degree Examinations of the University of London who are unable to attend regular College Lectures. For Prospectus apply to Secretary (Mr. H. J. Crawford, B.A.), 46, Russell Square, London, W.1.

OFFICIAL ADVERTISEMENTS intended for insertion on this page should be sent in as early in the week as possible. The latest time for receiving official advertisements for this page for the current week's issue is noon on Thursday. All advertisements should be addressed to :—*The Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1.

Crown Agents for the Colonies

COLONIAL GOVERNMENT APPOINTMENTS

APPLICATIONS from qualified candidates are invited for the following post :—

ASSISTANT ACCOUNTANT

required by the Government of Nigeria for the Railway Department, for two tours of 12-18 months each with possible permanency. Salary £400 a year for the first two years then £450 rising to £720 a year. Free passages and quarters and liberal leave on full salary. Candidates, aged 25-35, must, in addition to the necessary accounting knowledge, have had practical experience with Powers-Samas mechanical accounting methods and machines.

Apply at once by letter, stating age, whether married or single and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M/4551.

Closed Branch Lines—II

The London Midland & Scottish Railway

The table below, which is the second in our series, deals with the L.M.S.R. As the owner of the greatest railway mileage in Great Britain, this company has naturally been able to close to passenger traffic a long list of mainly unimportant sections of line. It will be noticed that (apart from the Manifold Valley narrow-gauge light railway and the Burton & Ashby electric tramway) practically no freight facilities have been withdrawn, and that almost all the passenger service withdrawals follow the establishment of co-ordination arrangements with bus undertakings. From this viewpoint the list is a tribute to the effectiveness of the co-ordination plans. It will be recalled that, in addition to buying extensive shareholdings in bus companies, the L.M.S.R. has played a prominent part in establishing joint arrangements with municipal transport operators, such as the Corporations of Halifax, Huddersfield, Sheffield, and Todmorden.

Section of Line (4 ft. 8½ in. gauge unless otherwise noted under Remarks)	Passenger Service Withdrawn	Section Completely Closed	Remarks
Wolverton to Stony Stratford	—	May 19, 1926	Steam tramway on public road
Langley Mill to Ripley ...	September 20, 1926	—	—
Mansfield to Pye Bridge ...	October 4, 1926	—	—
Burton & Ashby Light Railway	—	November 12, 1926	Electric street tramway, 3 ft. 6 in. gauge
Sowerby Bdg. to Rishworth	July 8, 1929	—	—
Halifax to Stainland ...	September 23, 1929	—	—
Garstang to Knott End ...	March 19, 1930	—	—
Brownhills to Aldridge ...	March 31, 1930	—	—
Little Eaton to Ripley ...	June 1, 1930	—	—
Preston to Longridge ...	June 2, 1930	—	—
Lancaster to Glasson Dock...	July 7, 1930	—	—
Greenhill to Bonnybridge ...	July 28, 1930	—	—
Deighton to Kirkburton ...	July 28, 1930	—	—
Kilwinning to Irvine ...	—	July 28, 1930	—
Greenhill to Denny	July 28, 1930	—	—
Larbert to Kilsyth	July 28, 1930	—	—
Chesterfield to Mansfield (via Bolsover)	July 28, 1930	—	—
Harecastle to Wheelock and Sandbach	July 28, 1930	—	—
Aspatria to Mealsgate ...	September 22, 1930	—	—
Carnarvon to Llanberis ...	September 22, 1930	—	—
Pear Tree & Normanton to Trent	September 22, 1930	—	—
Ashby de la Zouch to Chellaston	September 22, 1930	—	—
Holland Arms to Red Wharf Bay	September 22, 1930	—	—
Prestatyn to Dyserth ...	September 22, 1930	—	—
Skipton to Grassington ...	September 22, 1930	—	—
Airdrie to Newhouse ...	December 1, 1930	—	—
Giffen to Kilbirnie	December 1, 1930	—	—
Holytown to Morningside ...	December 1, 1930	—	—
Dewsbury branch	December 1, 1930	—	—
Ayr to Turnberry	December 1, 1930	—	—
Gowerton to Llanmorlais ...	January 5, 1931	—	—
Walsall to Short Heath ...	January 5, 1931	—	—
Moira to Nuneaton	April 13, 1931	—	—
Lunearty to Bankfoot ...	April 13, 1931	—	—
Moor Row to Workington (via Camerton)	April 13, 1931	—	—
Moor Row to Distington (via Workington)	April 13, 1931	—	—
Brechin to Edzell	April 27, 1931	—	—
Keele to Harecastle ...	April 27, 1931	—	—
Kirtlebridge to Annan ...	April 27, 1931	—	—
Fochabers Town to Orbliston Junc.	September 14, 1931	—	—
Alves to Hopeman	September 14, 1931	—	—
Androssan to Uplowmoor ...	July 4, 1932	—	—
Penygroes to Nantlle ...	August 8, 1932	—	—
Waterhouses to Hulme End	—	March 10, 1934	2 ft. 6 in. gauge
Monument Lane to Harborne	November 24, 1934	—	—
Bullgill to Brigham (via Dearham)	April 28, 1935	—	—
Leek to Waterhouses ...	September 28, 1935	—	—
Barrow to Piel	—	July 6, 1936	—

Railway and Other Reports

Interborough Rapid Transit Company.—The report for the year ended June 30 last, submitted by the receiver appointed by the U.S. Court, shows that gross operating revenue amounted to $56,453,077, an increase of $670,454, operating expenses to $36,148,756, an increase of $140,617, and net operating revenue to $20,304,321, an increase of $529,837. Taxes ($3,991,386) were $565,245 higher, so that the income of $16,312,934 from operation was $35,408 lower. Current rent deductions were $5,014,763, and the sum of $75,213 was used for purchase of assets from the enterprise, making a gross income of $11,373,384. Fixed charges required $14,250,161, leaving a net operating loss of $2,876,776. Non-operating income of $78,405 reduced this loss to $2,798,371, but the $7,910,154 deficit brought in and miscellaneous adjustments of $622 brought the total deficit at the end of the year to $10,709,147.

Maidstone & District Motor Services Limited.—This company's nominal capital has been increased from £700,000 (by £300,000) to £1,000,000.

Railway Share Market

Home railway stocks have been rather less active, but a steady undertone was maintained. The past week's traffic figures were below expectations, but they must nevertheless be regarded as satisfactory, for once again each of the main line railways is able to record an increase.

L.M.S. ordinary was again perhaps the most active feature and good demand was reported on any decline below 28. Both the 4 per cent. and 1923 preference held up quite well. For the past week the traffic gain was £26,000, which brings the railway's aggregate advance for the year to £1,607,000. L.N.E. first preference was firm around 75 and the second preference was around 30. In this case the traffic gain of £16,000 raises the increase for the year to date to £950,000. Southern deferred and preferred were steady but were reported to be rather less active, it having been hoped that the past week's traffics would have improved by more than £5,000. Great Western ordinary was inclined to make a better price following fractional movements around 50½. The demand was attributed to satisfaction with the week's traffic rise of £14,000 and to growing confidence that serious labour troubles in the South Wales coal trade will be averted. Prior charges have been in better demand and prices were higher, partly in sympathy with British Government stocks and investment issues generally. Great Western 4 per cent. debentures were fractionally higher at 115½ and L.M.S. debentures were very firm, but buyers found that stock was not in large supply in the market. London Transport "C" stock remained steady at 106½, aided by the satisfactory traffic return and by rather more favourable dividend estimates.

Argentine railway stocks were easier in the absence of an increase in demand, a disposition to await the annual meetings having remained in evidence. B.A. Gt. Southern has gone back to 16 and B.A. Pacific to 7, while Central Argentine is 11 and B.A. Western 13. Prior charges were fairly well maintained, but B.A. Pacific 5 per cent. debentures lost half a point to 20½ and Argentine Great Western 4 per cent. second debentures went back a point to 59. B.A. Western 4 per cent. debentures were fractionally lower at 66. San Paulo ordinary, which was favoured in anticipation of the forthcoming interim dividend decision, moved up to 60. Leopoldina debentures were better. Canadian Pacific ordinary and preference displayed a rather improved tendency, but American railroad shares were affected by the reactionary trend of New York markets. Union Pacific were weak and N.Y. Central moved down to 43.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1935-36	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1935	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1935	Prices: Lowest 1935	Prices: Sept. 2, 1936	Prices: Yield (see Note)
				£	£		£	£	£					
South & Central America.	Antofagasta (Chili) & Bolivia	834	30 8.36	12 520	+ 2,130	35	469,080	428,010	+ 41,070	Ord. Stk.	23	14 15/16	17 1/2	Nil
	Argentine North Eastern ..	753	29.8.36	9,607	+ 928	9	79,427	73 086	+ 6,341	,,	7	4	3 1/2	Nil
	Argentine Transandine ..	—	—	—	—	—	—	—	—	A. Deb.	49 1/2	30	47 1/2	8 7/16
	Bolivar	174	July, 1936	6,600	+ 1,300	30	47,600	44,700	+ 2,900	6 p.c. Deb.	13	5	10	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	14	11	15 1/2	3 1/4
	Buenos Ayres & Pacific ..	2,806	29.8.36	73,900	+ 4,023	9	639,854	648.036	— 8,182	Ord. Stk.	10 1/2	4 7/8	8	Nil
	Buenos Ayres Central ..	190	22.8.36	$128,600	+ $11,400	8	$990,900	$984.000	+ $6,900	Mt. Deb.	21	10	14	Nil
	Buenos Ayres Gt. Southern	5,084	29.8.36	115,718	— 8,005	9	946,910	1,044,972	— 98,062	Ord. Stk.	27	13 1/2	16	Nil
	Buenos Ayres Western ..	1,930	29.8.36	41,290	— 812	9	343,901	359,529	— 15,628	,,	24	10	13 1/2	Nil
	Central Argentine	3,700	29.8.36	144,384	+ 30,086	9	1,140,677	1,069,520	+ 71,157	,,	17 7/8	7	11 1/2	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	9	3 1/4	7	Nil
	Cent. Uruguay of M. Video	273	22.8.36	10,923	+ 3,434	8	79,946	66,534	+ 13,412	Ord. Stk.	8 1/2	3	4	Nil
	Do. Eastern Extn.	311	22.8.36	1,884	+ 362	8	13,804	11.066	+ 2,738	—	—	—	—	—
	Do. Northern Extn.	185	22.8.36	1,574	+ 583	8	11,876	9,344	+ 2,532	—	—	—	—	—
	Do. Western Extn...	211	22.8.36	1,021	+ 86	8	7,307	5,667	+ 1,640	—	—	—	—	—
	Cordoba Central	1,218	29.8.36	38,240	+ 5,940	9	326,520	302 220	+ 24,300	Ord. Inc.	4	1	1 1/2	Nil
	Costa Rica	188	June, 1936	26,958	+ 11,439	52	186,880	191,757	— 4,877	Stk.	35	30	33	6 1/16
	Dorada	70	July, 1936	16,000	+ 2,400	31	95,300	80,400	+ 14 900	1 Mt. Db.	103 5/8	102 1/2	104 1/2	5 4
	Entre Rios	810	29.8.36	12,293	— 420	9	104 582	109,548	— 4 966	Ord. Stk.	15	6 1/2	7	Nil
	Great Western of Brazil ..	1,082	29.8.36	5,700	+ 500	35	257,500	257,500	—	Ord. Sh.	1/2	3/16	1/2	Nil
	International of Cl. Amer.	794	July, 1936	$310,697	— $17,787	31	$3,307,311	$2,960,670	+ $346,641	—	—	—	—	—
	Interoceanic of Mexico ..	—	—	—	—	—	—	—	—	1st Pref.	1/2	5/32	1/2	Nil
	La Guaira & Caracas ..	22¾	July, 1936	4,910	+ 1,185	30	32,250	27,570	+ 4,680	Stk.	8 1/2	8	5 1/2	Nil
	Leopoldina	1,918	29.8.36	25,412	+ 5,600	35	640,957	587,859	+ 53,098	Ord. Stk.	8 1/2	2 1/2	4 1/2	Nil
	Mexican	483	21.8.36	$288,700	+ $69,400	8	$1,784,800	$1,856.100	— $71,300	,,	1 1/2	1/4	1/2	Nil
	Midland of Uruguay ..	319	July, 1936	7,734	+ 2,232	5	7,734	5,502	+ 2,232	,,	1 1/2	1 1/2	1/2	Nil
	Nitrate	397	31.8.36	2,008	— 5,516	35	86,121	101,134	— 15,013	Ord. Sh.	64/-	42/-	21 1/16	Nil
	Paraguay Central	274	29.8.36	$2,841,000	+ $183,000	9	$22,602,000	$19,314 000	+ $3,288,000	Pr. Li. Stk.	80 1/2	60	72 1/2	8 1/4
	Peruvian Corporation ..	1,059	July, 1936	84,321	+ 10,508	4	84,321	73 813	+ 10,508	Pref.	10 5/8	6 7/16	10 1/4	Nil
	Salvador	100	22.8.36	49,876	+ 7676	8	381,499	497,636	— 116,137	Pr. Li.Db.	65	61	15	Nil
	San Paulo	153½	23 8.36	28,132	+ 3,281	34	1,912 346	811,179	+ 201,167	Ord. Stk.	80	35	59 1/2	4 5/16
	Taltal	164	July, 1936	2,525	—	5	2 525	2 525	—	Ord. Sh.	11 1/16	1/8	15/16	12 5/16
	United of Havana	1,353	29.8.36	17,178	+ 2,154	9	139,091	163,000	— 23,909	Ord. Stk.	3 1/16	1	2 1/2	Nil
	Uruguay Northern	73	July, 1936	866	+ 232	5	866	634	+ 232	Deb. Stk.	4 1/2	2 15/16	4 1/2	Nil
Canada.	Canadian National	23,615	21.8.36	711,082	+ 83,105	33	22,167,197	20,855,866	+ 1,311,330	—	—	—	—	—
	Canadian Northern ..	—	—	—	—	—	—	—	— 4 p.c.	Perp. Dbs.	78 5/8	52 1/2	67 1/2	5 15/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	103 5/8	93	101 1/2	3 15/16
	Canadian Pacific	17,237	21.8.36	520,400	+ 42,800	33	16,204,000	14,945 2 0	+ 1,258,800	Ord. Stk.	14 1/16	8 5/8	12	Nil
India.†	Assam Bengal	1,329	10.8.36	28.538	— 1,771	19	439,052	425,953	+ 13,099	Ord. Stk.	92 1/8	77 1/2	85 1/2	3 1/2
	Barsi Light	202	10.8.36	2.760	+ 7	19	47,610	56 850	— 9,240	Ord. Sh.	105	77 1/2	72 1/2	6 7/8
	Bengal & North Western ..	2,112	10.8.36	59,827	+ 2,230	19	1,105,391	952,811	+ 52.580	Ord. Stk.	30 11/2	29 1/4	31 0	5 5/16
	Bengal Dooars & Extension	161	10.8.36	3,427	— 457	19	43,649	44,480	— 831	,,	12 7/16	12 2	12 5/16	5 9/16
	Bengal-Nagpur	3,268	10.8.36	137,025	— 16,277	19	2,208,253	2,344,301	— 136,045	,,	10 5	10 0 5/16	10 2 1/2	3 7/8
	Bombay, Baroda & Cl. India	3,072	20.8.36	181,125	+ 14,700	20	3 279,300	3,063,750	+ 215,550	,,	11 5 1/4	11 0	11 1 1/2	5 7/8
	Madras & Southern Mahratta	3,229	10.8.36	136,500	+ 3,948	19	2.098.078	2,036.537	+ 61,541	,,	12 8 1/2	11 3 7/8	11 2 1/2	8
	Rohilkund & Kumaon ..	546	10.8.36	9 849	+ 1,068	19	203 267	183 811	+ 19,456	,,	29 4	26 2	30 8 1/2	5 5/16
	South India	2,532	20.7.36	105.435	— 6 084	16	1,249.030	1,279,657	— 30,627	,,	11 9 5 4	10 4 1 4	10 3 1/2	5 5/16
Various.	Beira-Umtali	204	June, 1936	64,192	+ 8,141	39	577,342	576,265	+ 1,077	—	—	—	—	—
	Bilbao River & Cantabrian	15	July 1936	1,677	+ 547	31	10,202	11,035	— 833	—	—	—	—	—
	Egyptian Delta	620	10.8.36	6.102	+ 12	19	76.239	70,235	+ 6,004	Prf. Sh.	2	15/8	1 1/4	5 11/16
	Great Southern of Spain ..	104	8.8.36	279	— 969	32	32,166	55,775	— 23.609	Inc. Deb.	3 1/2	2	3 1/2	Nil
	Kenya & Uganda	1,625	July, 1936	184 229	+ 4,789	30	1,614,901	1,472,623	+ 142 278	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	48	36	43	9 1/8
	Mashonaland	913	June, 1936	100.926	— 1,113	39	916 081	1,047 960	— 131,879	1 Mg. Db.	104 1/4	100	103 1/2	4 13/16
	Midland of W. Australia ..	277	June, 1936	11.961	+ 222	52	161.372	159 574	+ 1,798	Inc. Deb.	98 3/4	93	95	4 5/16
	Nigerian	1,905	11.7.36	26,158	+ 2,390	15	439,129	375 493	+ 54,636	—	—	—	—	—
	Rhodesia	1,538	June, 1936	188 938	+ 6 401	39	1,668 785	1,724,710	— 55,925	4 p.c. Db.	105 1/2	101	105 1/2	3 15/16
	South African	13,263	8.8.36	531.679	+ 62.499	19	11,008,103	10,133,143	+ 874,990	—	—	—	—	—
	Victoria	4,728	May 1936	779 712	+ 8,120	48	8,986 232	8,734.254	+ 251,978	—	—	—	—	—
	Zafra & Huelva	112	May, 1936	8,821	— 2,027	22	48,574	55,398	— 6,823	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

Light Railcars in the Saar

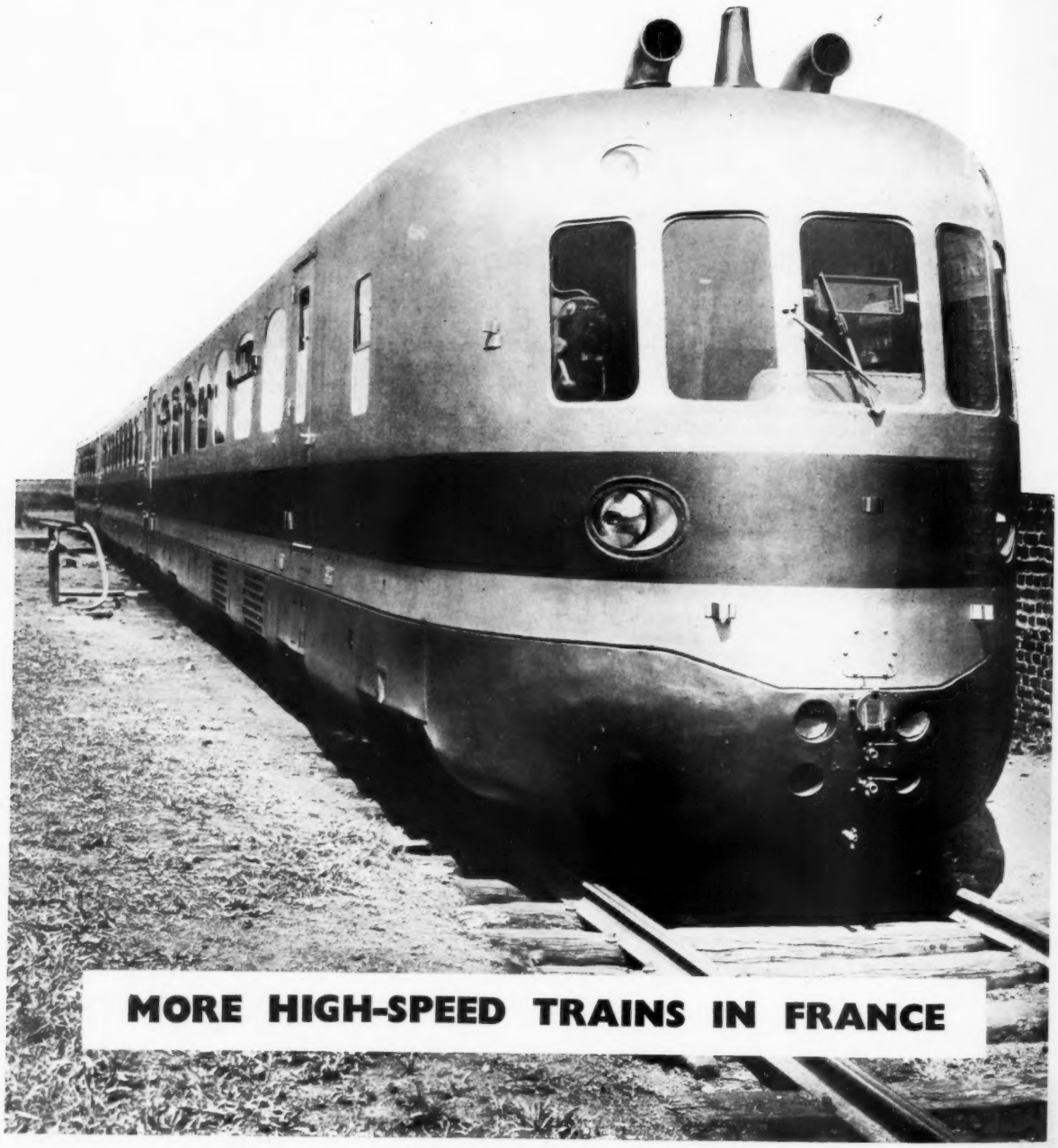
ANOTHER indication of the all-round efficiency of diesel railcars for branch line traffic will be found in the brief account of railcar operation in the Saar reproduced elsewhere in this issue. On one branch they have taken over the entire passenger traffic, and also, by reason of the use of quickly-convertible cars, they work a good deal of parcels, milk, and light goods traffic. The gross operating costs prove a striking vindication of the argument that up-to-date equipment is more economical than old stock, *even when the latter has no financial charges entered on its cost sheets.* The gross operating costs, including interest and depreciation, of the Saar diesel cars are only 50 per cent. of those of the replaced steam trains and 65 per cent. of those of the electric-battery railcars, although interest and depreciation charges of these two types of old equipment have long since been written off. Moreover, it has been found possible to increase the service offered by 200 per cent. over the Bliestal line, but the overall times have not been reduced because of the insertion of additional stops. The old steam trains weighed with locomotive about 125 tons, but for equivalent carrying capacity (190 passengers sitting and standing) the railcars weigh only 30 tons. However, none of the railcars is fitted for multiple-unit operation or is suitable for coupling to one of its fellows, and a more frequent service therefore was necessary. The headway at the busiest time of the day is 5 or 6 min., but during normal hours the cars have to be sandwiched between frequent goods trains, mostly carrying chalk and beer, and which load up to 60 wagons.

Diesel Train Speeds in Europe

THE fast service between Lille and Havre and the additional service between Tourcoing, Lille and Paris just inaugurated by the new diesel trains of the Nord, bring that railway into a leading position as regards high-speed diesel train mileage in France. At start-to-stop speeds of 60 m.p.h. or over the Nord diesel trains cover 719 miles a day, compared with 634 on the P.L.M. and 283 on the Etat. Over the 42·2 miles between Amiens and Arras the standard time in both directions is 37 min., corresponding to a start-to-stop average of 68·4 m.p.h., and over the 81·4 miles from Paris to Amiens the standard time in each direction is 73 min., or an average speed of 66·9 m.p.h. On the Etat, one of the 1,000 b.h.p. Renault trains is operating on the Havre line where the start-to-stop average speed from Paris to Le Havre, 141·7 miles, is 72 m.p.h. The P.L.M. mileage is made up by the Lyons-Paris return trip of one of the 530 b.h.p. twin-car Renaults, which takes 5 hr. in each direction, including two stops aggregating 3 min., for the 317·5 miles. The fastest run is over the 99·0 miles from Dijon to Laroche in the up direction, which occupies 85 min., or an average of 69·9 m.p.h. All these French trains are allowed a maximum speed of 87 m.p.h. (140 km.p.h.). Over the whole of Europe the daily mileage operated by diesel set trains (not railcars or railcar-hauled trains) at 60 m.p.h. or over amounts to about 5,400, spread over France, Germany, Belgium, and Denmark, the German State Railway leading the field with 3,290 miles a day. By the end of the year this total should be increased by the introduction of mile-a-minute services on the Italian State Railways. In addition, about 8,700 miles a day in the above-named countries and in Holland are covered at start-to-stop speeds of less than 60 m.p.h., the maximum allowable speeds being 75 m.p.h. for certain trains in France and Denmark and 62 m.p.h. for the 40 Dutch trains. The longest non-stop run made by any diesel train in Europe is over the 204·6 miles from the Schlesischer Bahnhof, in Berlin, to Breslau, which distance is covered in 159 min. at an average of 77·2 m.p.h.

Opposed-Piston Engines

TWO-STROKE engines have been used in railway traction since pre-war days, but always in relatively small numbers compared with the four-stroke total. During the last four or five years greater attention has been given to the development of a railway two-stroke engine and the results are to be found in the Burmeister & Wain (and B. & W.-Harland) engine in Europe and the Winton engine in America. But since 1932 there have been at work in France a number of two-stroke engines which are somewhat unusual in following the famous Junkers opposed-piston principle. Built in France by the Compagnie Lilloise de Moteurs, a light maintenance bill and regular operation has characterised these engines. The original 85 and 105 b.h.p. engines used on the P.O.-Midi, Etat, Est, and Alsace-Lorraine systems, and also in Syria, have been developed into higher-power models with a top limit of 500 b.h.p. The main constructional difference between the old and new types is that the double connecting rods taking the drive of the top piston of each cylinder to the crankshaft have been given up in favour of a gear connection such as that used in the Junkers aircraft engine, a feature which gives excellent balance and eliminates vibrations due to reciprocating motion. The new models are all of the vertical in-line type, although a vee or inverted-vee type, such as the erstwhile Knudsen engine, could have been built. It was felt that the vertical type had a distinct advantage in that there was no space between two banks of cylinders which might act as a trap to leakage of fuel or lubricating oil, with consequent danger of fire. The accessibility of a vertical engine was considered as a further incentive to forego the vee arrangement, and this accessibility is obtained in conjunction with simplicity, for the opposed-piston principle does away with the usual push-rods tappets and valves. From the description of the new engines given elsewhere in this issue it will be noted that the 500 b.h.p. model is the lightest non-supercharged engine ever used in railway work.



MORE HIGH-SPEED TRAINS IN FRANCE

THE fast Paris-Lille-Tourcoing services worked by the two 820 b.h.p. triple-car oil-electric trains of the Ch. de fer du Nord since July, 1934, have been augmented by further services on the Lille-Amiens-Rouen-Havre route since the introduction of some of the eight new trains now being delivered by the Société Franco Belge, of Raismes, the builder of the two original trains, and also by another Paris service.

In general design these new trains are very similar to the 1934 model, but the cars are longer, a different form of electric transmission has been adopted, and there are sundry changes in the design of the Maybach engine. Attention has been given also to the incorporation of a suitable type of multiple-unit control for it is the intention ultimately to use certain of these rakes coupled two or three together and separate them at given points, each rake running thenceforward over a different route. The last of the eight new trains is being fitted with Büchi superchargers, which will raise the total output from 820 to 1,200 b.h.p. The two original trains were illustrated and described in the issue of this Supplement for July 13, 1934.

Mechanical Portion

The three carriages of each set are not articulated but are close coupled together. The power cars at each end are identical, and contain a driving-cum-engine room, a luggage compartment, a lavatory, and a second class saloon with 48 seats arranged two on each side of the central gangway. Ventilation is carried out by 24 venti-

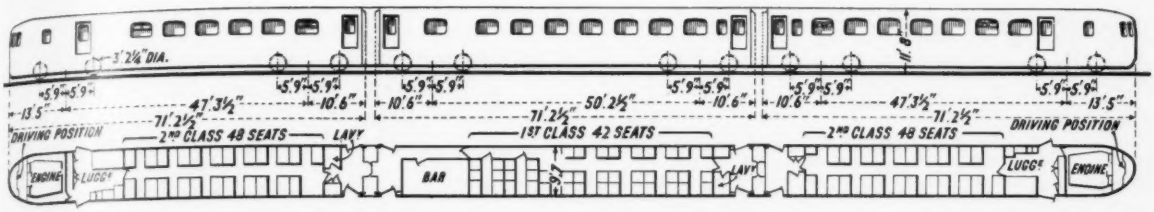


Diagram of the new 820 *b.h.p. diesel-electric trains of the Northern Railway of France now at work on the Paris-Lille and Lille-Le Havre services. These trains tare* 133.85 *tonnes*

lators, but the four end windows in each power car are equipped with the MM Air-Stream ventilators made by Mead & McLean Limited, and fitted to numerous carriages on the Southern Railway in England. In very hot weather a system of forced ventilation can be brought into use, air being forced through the passenger saloons by an electrically-driven ventilator with a capacity of 1,500 cu.m. (52,500 cu. ft.) an hour at a pressure of 7 in. of water. Plants are in existence at the Gare du Nord for circulating cool air through the saloons before the train starts.

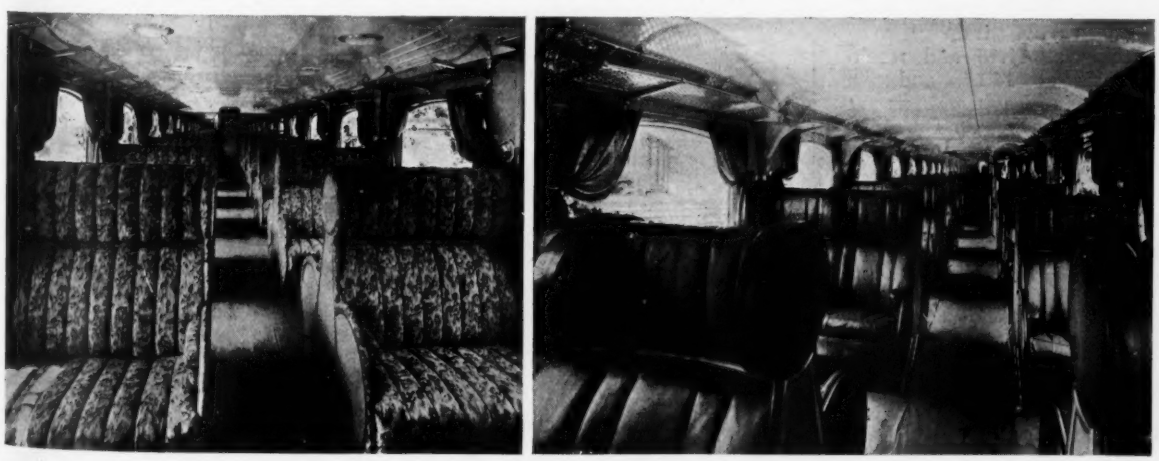
All-welded steel construction is used for the body, which is of tubular form. The inner longitudinal members are used as ducts for the ventilating air, and are of rectangular form in place of the rolled sections used in the two 1934 trains. The bogies are identical with those fitted to the original trains and have independent vertical and transverse suspension systems. The bogie frames are of chrome-molybdenum steel and the axles, carried in S.K.F. roller bearings, are of nickel-chrome steel. Wheels of 38 in. diameter are used and are spread over a wheelbase of 11 ft. 6 in.; the bogies of the power cars are pitched at 47 ft. 4 in. centres. Braking is on the oil-pneumatic Lockheed system as made by Jourdain-Monneret and the braking force is applied to drums secured to the wheel centres. A hand brake is fitted, and also an electro-magnetic brake for use in emergencies. This electro-magnetic brake differs from that of the 1934 trains in having two shoes per bogie with a braking force of 18 tonnes each, whereas the original sets had four shoes per bogie with a retarding force of 4 tons each. Further, the present Jourdain-Monneret brake includes provision for different applications according to whether the rails are wet or dry, and also an automatic release which comes into operation when the wheels slide.

The trailer, marshalled between the two power cars, carries only first class passengers, and has a small kitchen at one end. Meals are served on detachable tables between the seats. The general construction of the trailer is akin to that of the power cars, to which it is joined through a double vestibule connection of rubber which continues the smooth lines of both the interior and exterior side panels. Heating is effected by means of hot water radiators located between the inner and outer side panels, and over which passes the ventilating air before it is led into the passenger saloon. The air temperature is regulated thermostatically. Two Glacia refrigerators are brought into the ventilating circuit during the summer, and they enable the temperature in the car to be kept from 4 to 4·5° C. below the outside air temperature.

Power and Transmission Equipment

The principal difference in the Maybach engines compared with those installed in the 1934 trains is that the cylinder diameter has been increased from 150 to 160 mm. although both the output and speed remain the same. This alteration is not peculiar to the Nord trains, but applies to Maybach practice generally. Further alterations are balancing of the crankshafts by counterweights attached to the webs, and the provision of two inlet and two exhaust valves per cylinder, compared with one of each previously. As installed in the new trains the Maybach engine has 12 cylinders with a bore and stroke of 160 mm. by 200 mm. (6·31 in. by 7·9 in.) and has a continuous rating of 410 b.h.p. at 1,400 r.p.m.

Each engine-generator set is mounted direct on one of the outer bogies. The main generator is of 350 kW. capacity and is coupled to the engine through a short shaft with two flexible couplings. The inner bogie of each power car is driven by two 175 kW. self-ventilated nose-suspended traction motors. The ventilating air both for the traction motors and the main generators is drawn from the passenger saloons, thus eliminating the ingress of dust and assisting in the ventilation of the car interior. An auxiliary generator on each group charges the 143



Interior of the second and first class saloons of the Nord diesel trains

amp. hr. 110-volt cadmium-nickel battery of each power car, but an axle-driven generator on the trailer charges the similar battery on that vehicle.

The Jeumont system of electric transmission control has been embodied in place of the Gebus control used on the two 1934 trains. With the Jeumont system the voltage varies directly with the vehicle speed. The exciting current of the main generator is supplied, through the accumulator, by an exciter driven mechanically from one of the axles. This exciter has a shunt winding and a separate excitation winding which are fed from the battery. To enable the train to start, the main generator is provided with a special separately-excited winding which is supplied with current direct from the battery. When the train is in motion the engine speed and torque and the resistance torque of the main generator are regulated by varying the amount of fuel injected and by altering the excitation by means of a field rheostat and the separate excitation circuit of the exciter.

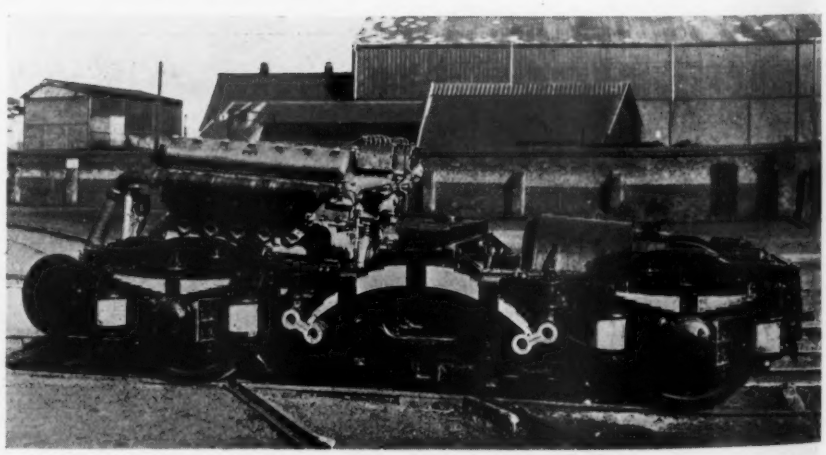
Services

The two original trains have covered an aggregate of over 250,000 miles on the Paris-Lille-Tourcoing services since July, 1934, at start-to-stop speeds in excess of 60 m.p.h. Their normal roster has been the train leaving Tourcoing at 11.15 and reaching Paris at 14.15, and the return train leaving Paris at 16.35 and arriving at Tourcoing at 19.35. These timings now have been accelerated by 6 min. in both directions, and the service has been supplemented by another, leaving Tourcoing at 8.12, reaching Paris at 11.07, leaving again at 12.05 and arriving at Tourcoing at 15.00. From Paris to Amiens the 81·4 miles are covered in 73 min. by the midday train, equivalent to 66·9 m.p.h., and the ensuing 42·4 miles on to Arras in 37 min. at a start-to-stop average of 68·4 m.p.h. This turn is worked by the new triple-car trains, as is also a cross-country service between Lille and Havre which is run over the Nord and Etat systems via Rouen.

Above : Twelve-cylinder Maybach supercharged engine of the type being fitted to the last of the Nord high-speed trains

Left : Driving position and controls of the new Nord 820 b.h.p. oil-electric trains

Below : Outer bogie of the power cars of the Nord trains, carrying the Maybach oil-engine and the main generator



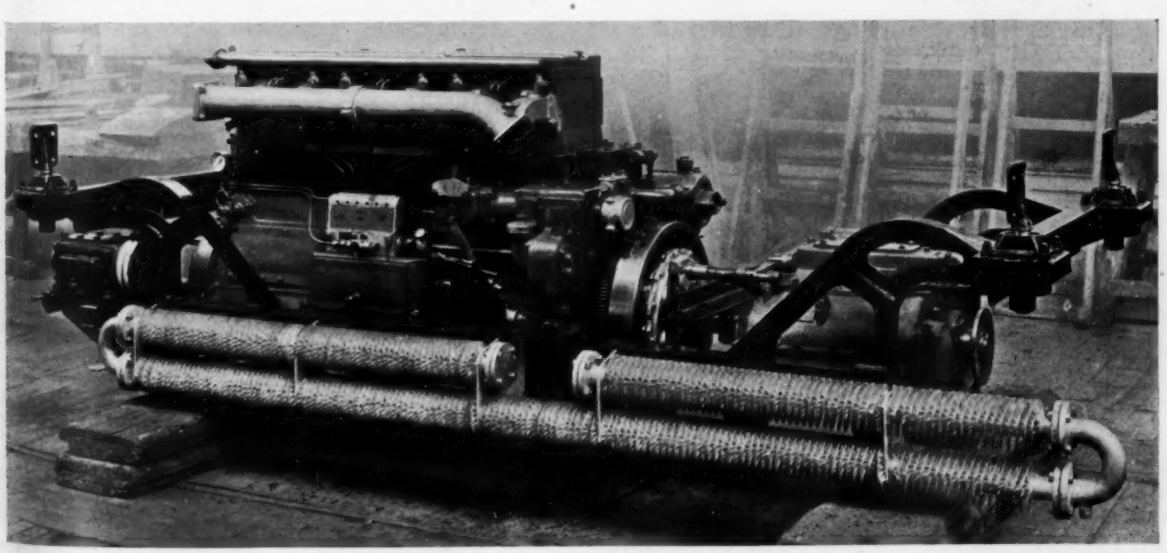
NEW GERMAN RAILCAR FOR LOCAL TRAFFIC

300 b.h.p. diesel-mechanical railcar for local trains on heavy grades

THE successful results obtained with the two four-wheeled diesel cars set to work in 1935 (see issue of this Supplement for July 12, 1935, p. 85) have led the Hohenzollerische Landesbahn, in Germany, to acquire a further car of just twice the power, and together with the four-wheeled cars this vehicle is operating from Sigmaringen to Haufestal and Eyach, over which routes there are grades as steep as 1 in 36, the line rising 800 ft. in 8 miles between Hechingen and Buraldingen. The speed over the heaviest grades has been increased by the railcars to 18 m.p.h. from the 12 m.p.h. of the steam trains.

Of the double-bogie type, the new car has a top speed in service of 46 m.p.h. Power is provided by two 150 b.h.p. M.A.N. engines running at 1,500 r.p.m. These engines are not bogie-mounted, but are carried on a welded steel subframe below the car floor, each engine driving the inner axle of the adjacent bogie by means of a four-speed Mylius gearbox. The gearbox ratios are 4·78, 2·61, 1·53, and 1·0 to 1. The engine and transmission are supported as one unit through the medium of rubber pads. The air brake compressor and the radiator fan are driven by a belt from the engine. An oil cooler of the Sauerbier type is fitted alongside the engine. The controls are of the Mylius mechanical-pneumatic type which permits either or both engines to be controlled from each driving position. Knorr air brakes are fitted and air-operated sanders on each side of all four driving wheels have been supplied.

The car was built by the Waggon und Maschinenbau A.G. of Görlitz, and embodies that company's standard all-welded light-weight body and underframe construction. The overall body length is 67 ft. and the bogies have a wheelbase of 9 ft. 10 in. and are pitched at 47 ft. 7 in. centres. Peyinghaus axleboxes are fitted. Seats for 83 passengers are provided in three saloons, viz. 8 second class, 39 third class smoking, and 40 third class non-smoking. Luggage room and lavatory accommodation is provided also. Four electric fans are provided down the ceilings to give ventilation when all the windows are closed. When the weather is cold the car is heated by hot water from a coke-burning stove located beneath the car floor.



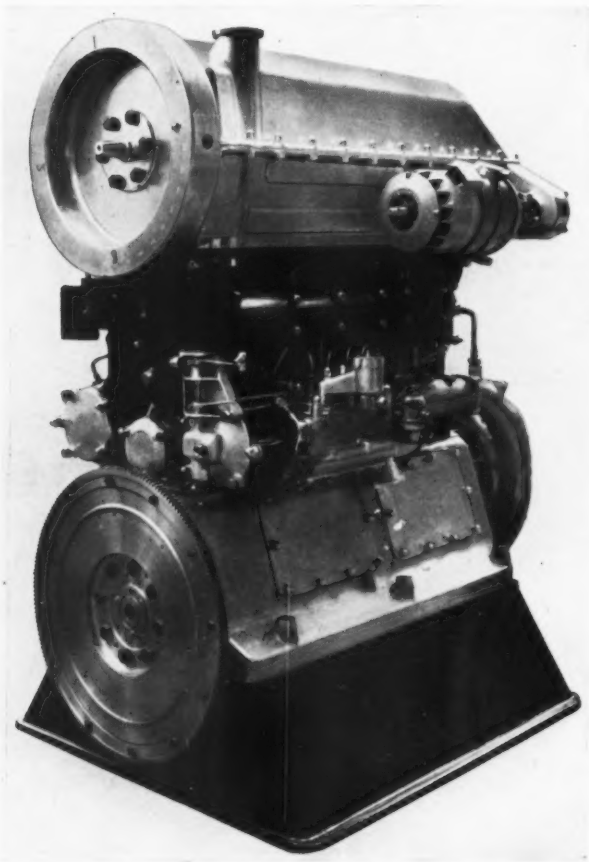
150 b.h.p. M.A.N. engine, Mylius gearbox, and Sauerbier oil cooler mounted on welded steel subframe

A TWO-STROKE OPPOSED-PISTON RAILCAR ENGINE

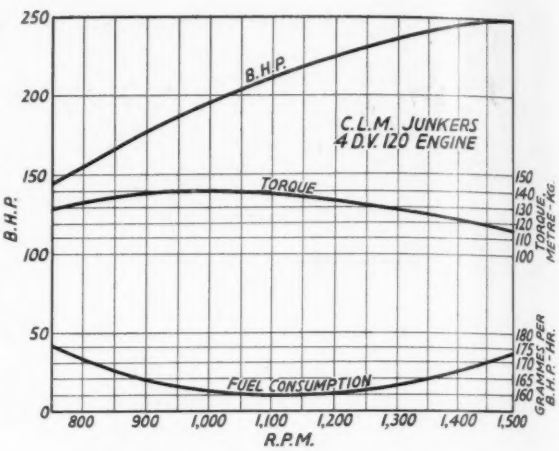
New developments of a proved design

ONE of the most successful of the oil-engines used in French railcars is the Junkers type of two-stroke opposed-piston unit made by the Compagnie Lilloise de Moteurs, and known as the C.L.M.-Junkers engine. As far as rail traction is concerned this make hitherto has been used only up to 105/110 b.h.p., which model is installed in numerous Charentaise and De Dietrich railcars, but larger sizes are available now and will go into service in France at an early date.

The engines just introduced are of 150, 250, and 500 b.h.p. respectively on the continuous rating, and have the characteristics indicated in the accompanying table. All types have a single cylinder bank for the sake of accessibility. Two pistons, each with its own crankshaft, are contained in each cylinder, and the two shafts are connected by large gears to the single output shaft. The two sets of crankshafts and pistons, with their flywheels, turn in opposite directions, and as the moments of inertia of the two groups are the same the balance is good and the cyclic variation is about $\frac{1}{180}$. Vibrations due to the reciprocating parts and to the engine couple are virtually eliminated at all speeds. The top pistons control the exhaust port openings and the bottom pistons the scavenge port events.



Off-side of C.L.M.-Junkers engine



Characteristic curves of 250 *b.h.p. engine*

Fuel is injected by C.L.M. pumps through two nozzles opposite to each other midway down the cylinder barrel, and this opposed injection, together with the movements of the two pistons in opposite directions, gives a good mixing of the fuel and air. Scavenging air is provided by a blower driven from the output crankshaft through gears.

Test Results

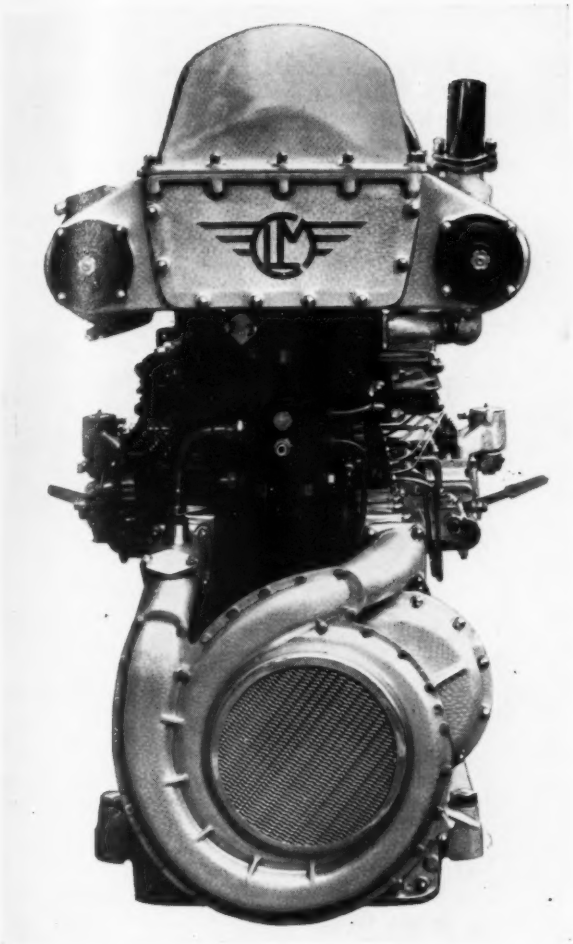
A 72-hr. continuous trial was given to one of the 4DV. 120 engines under the direction of the French Inter-Railway Commission, and the following notes are taken partly from the report of that organisation. The engine operated without any stop throughout the 72-hr. and up to 10 per cent. overload—the maximum power tested—the exhaust was practically colourless. The fuel used had a specific gravity of 0·832 at 19° C. and was of 10,550 calories heat value.

At the normal full-load speed of 1,500 r.p.m. the average fuel consumption was 172·9 gr. (0·38 lb.) per b.h.p. hr., and the minimum consumption, obtained at a speed of 1,100 r.p.m., was 160·9 gr. (0·358 lb.) per b.h.p. hr. Throughout the test the consumption of lubricating oil averaged 4·18 gr. (0·091 lb.) per b.h.p. hr. and the oil

C.L.M.-Junkers Two-Stroke Opposed-Piston Engines

Type	6DV. 85	4DV. 120	8DV. 120
No. of cylinders*	6	4	8
Cylinder diameter, mm.	85	120	120
Stroke of each piston, mm.	105	150	150
R.p.m.	2,100	1,500	1,500
Brake m.e.p., lb. per sq. in.	64	78	78
Piston speed, ft. per min.	1,435	1,480	1,480
Weight, with scavenging equip. lb.	1,440	2,980	4,200
Continuous b.h.p.	150	250	500
Maximum b.h.p.	165	275	550
Fuel consumption at full load, lb. per b.h.p. hr.	0·375	0·353	0·353

* Each with two opposed pistons.



End view of C.L.M.-Junkers 250 b.h.p. two-stroke opposed-piston engine showing scavenging blower

temperature was 75° C. The cooling water temperatures averaged 56·5° C. at the inlet and 65·5° C. at the outlet, and the mean exhaust temperature was 310° C. at the right-hand outlet and 315° C. at the left-hand outlet. The exhaust pressure was 100·6 gr., and the average scavenging pressure 0·37 kg.

Overload tests were given, comprising one hour developing 275 b.h.p. (10 per cent. over the rating) at the normal speed of 1,500 r.p.m., followed immediately by a 15-min. run at 1,650 r.p.m. (10 per cent. overspeed) with the same output of 275 b.h.p. At 275 b.h.p. and 1,500 r.p.m. the fuel consumption was 174 gr. (0·384 lb.) per b.h.p. hr., the cooling water temperatures 56° C. inlet and 65° C. outlet, the oil temperature 75° C., the exhaust temperature 350° C., and the scavenging pressure 0·42 kg. Further trials were made to show the characteristics of the engine at low rotational speeds, and 600 r.p.m. was maintained with regularity over a period of 30 min. The engine also ran for three successive periods at slow speed alternating with three 10-min. periods at 250 b.h.p. 1,500 r.p.m.

Inspection of the engine after the 72 hr. on the test bench showed that the pistons were slightly coated, but this deposit was removed easily by means of petrol. There was no trace of scoring or wear on the gudgeon pins or on the cylinder walls, and the big end bearings and the bearings of all crankshafts were in good condition.

The balancing of the engine was investigated by the inspecting engineer of the French railway commission, and the results are as given in the following table. Each driving set comprised a piston, gudgeon pin, and connecting rod complete with big end bearing.

Number of driving set	Weight, kg.	Difference, gr.	Permissible weight difference in gr. with tolerance of 0·6 per cent.
1–8	18·567 18·561	6·0	108
2–7	18·505 18·504	1·0	108
3–6	18·560 18·564	4·0	108
5–4	18·570 18·534	36·0	108

Brevities

DIESEL TRAIN PRICES.—According to recent statistics the average cost of a five-car streamlined diesel-electric train in the U.S.A. is $423,000 (£87,000) complete.

AMERICAN SHUNTER.—The American Locomotive Company has delivered to the Peoria and Pekin Union Railroad a double-bogie oil-electric shunting locomotive with an Alco engine and G.E.C. electrical equipment.

BRAZILIAN RAILCARS.—The Fiat works, at Turin, is to build five diesel railcars of a modified Littorina type for the Central Railway of Brazil. They are to be used between Rio de Janeiro and São Paulo and from Rio to Bello Horizonte.

ANOTHER BIG AMERICAN LOCOMOTIVE.—The Union Pacific Railroad is stated to have ordered a 3,600 b.h.p. diesel-electric locomotive from the Electro-Motive Corporation. It is to be used on cross-continent passenger trains.

PAXMAN ENGINES.—Over 30 Paxman oil engines are being built for small locomotives at the works of Davey, Paxman & Co. (Colchester) Ltd. They vary from 20 to 180 b.h.p., and all will have the Ricardo air-cell type of cylinder head.

MORE GERMAN DIESELS.—It is reported that the Reichsbahn has ordered 10 further triple-car streamlined diesel-electric trains for fast point-to-point services in the Ruhr. The aggregate engine power will be 820 b.h.p. and the maximum speed 75 m.p.h. Large second and third class seating accommodation will be provided.

TWIN ZEPHYRS.—Our American correspondent recently made a run in the driving cab of one of the Zephyr trains between Chicago and the Twin Cities, and informs us that although the schedule is equivalent to an average of 66 m.p.h. for the 431 miles, the speed never exceeded 90 m.p.h., and that time was kept by the maintenance of a steady 80 m.p.h. throughout all but a small part of the journey.

G.W.R. DIESEL CARS.—Practically the whole of the services now being operated by the A.E.C. diesel-mechanical railcars on the Great Western Railway will be retained when the winter timetables come into operation on September 28, and in addition a new service will be inaugurated between Bristol and Cardiff via the Severn tunnel, which will be made up of four trips a day in each direction. The present daily diesel car mileage on the G.W.R. is 3,584.

THE STREAMLINED DIESEL TRAIN IN EUROPE

A summary of the present position

The latest Belgian streamlined oil-electric train. It is powered by two 400 b.h.p. oil engines, seats 229 passengers and tares 138 tonnes

HOW far past the experimental stage is the streamlined diesel train in Europe may be judged by the fact that 34 of these units maintain daily services at speeds in excess of 60 m.p.h. totalling 5,400 miles, while another 50 trains are used for services under 60 m.p.h. and aggregating 8,700 miles. The total route mileage worked over is 3,925. Moreover, with the exception of 35 of the Dutch trains, the availability of all these sets has been over 85 per cent. To this total of 84 two- and three-car trains must be added another 29 rakes which are under construction, and 18 of them will be delivered during 1936. Including the vehicles under construction, the above diesel stock is distributed over seven countries.

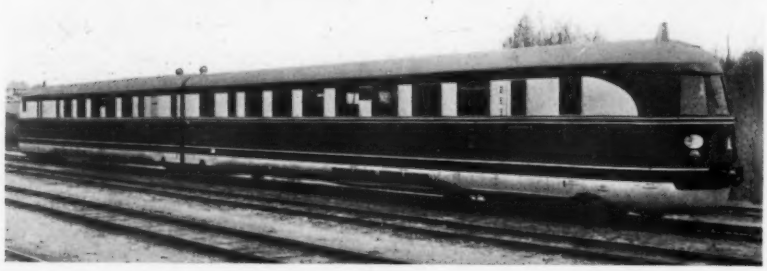
Undeniably the greatest feature of this extensive use of diesel trains is the lightning fast schedules to which these trains work, and which culminated last year in the introduction of start-to-stop timings in excess of 80 m.p.h. for the first time in railway history. The two bookings of 82·3 and 80·9 which the German trains, the Fliegende Kölner and Fliegende Frankfürter, achieved in 1935, have this year grown to four start-to-stop runs totalling 620 miles at speeds of 80·4 to 82·2 m.p.h., including a run of 267·4 miles from Berlin to Hamm at an average of 81·4 m.p.h. *inclusive* of a stop at Hanover.

Germany

The development of the German high-speed trains, and indeed of all European sets, began with the celebrated *Flying Hamburger* set to work experimentally in October, 1932, and in regular service in May, 1933. The German State Railway spared neither time nor money to make this double-car 820 b.h.p. train a success and gradually all the troubles were rooted out. Consequently when 13 new trains were built last year they embodied a number of improvements and were put straight into arduous service without any misgivings.

Operating on the Fliegende Hamburger, Fliegende Kölner and Fliegende Frankfürter services, where end-to-end speeds of 72-77 m.p.h. are maintained for 180 to 360 miles, these trains consume about 2·7 lb. of fuel and 0·146 lb. of lubricating oil per mile. They are powered by two 410 b.h.p. Maybach engines weighing 11 lb. per b.h.p., and mounted one on each end bogie along with a d.c. generator. The two electric traction motors are mounted on the centre articulation bogie. This is another interesting feature of the German trains, for perhaps through the superb permanent way on the main lines, no trouble has been occasioned by the use of partly unsprung motors at continuous speeds of 100-105 m.p.h., although trouble with the same type of motor on multiple-unit electric trains occurs frequently at 65 m.p.h. or over. Within a tare weight of 91·2 metric tonnes and a length of 145 ft. 3 in., 77 second-class seats and a buffet have been provided. The bodies and underframes of each coach are constructed as an integral unit, and the framing is almost entirely welded.

Certain of the German services are operated by the four three-car trains with two 600 b.h.p. supercharged Maybach engines, two of which have electric and two Voith hydraulic transmission. The seating capacity of these trains is 139, and both second and third class accommodation is provided, in contradistinction to the two-car sets, which are second class only. It was one of



One of the 13 new high-speed trains set to work on the Fliegende Kölner, Fliegende Hamburger, Fliegende Frankfürter and other German high-speed services in 1935-36

these trains which set up the diesel train speed record of 127 m.p.h. in March last. Further trains with supercharged M.A.N. engines of 1,300 b.h.p. are on order, and in these sets the engines will be mounted on the underframe of the centre vehicle.

France

In France, the development of high-speed diesel propulsion has tended to keep along the lines of single-unit railcars, but there are four three-car and nine two-car trains in service, and another eight three-car rakes in course of delivery. The two-car sets comprise the 530 b.h.p. Renault diesel-mechanical sets on the French State and P.L.M. Railways, and in each case the services worked have schedules lower than 60 m.p.h., except the services now operated between Lyons and Paris on the P.L.M., which average 60¼ m.p.h. including a one-minute stop at Laroche and a two-minute stop at Dijon. These trains seat 88 persons on a tare weight of 51 tons, and are powered by two of the standard Renault 265 b.h.p. 12-cylinder vee engines.

Recently Renault has produced a 16-cylinder vee engine developing 500 b.h.p. at 1,500 r.p.m. and this is used in the two 1,000 b.h.p. three-car trains just delivered to the French State Railways. These double-engined trains seating 140 persons on a tare weight of 80 tons are noteworthy, apart from their power, by the fact that four-speed mechanical transmission is used.

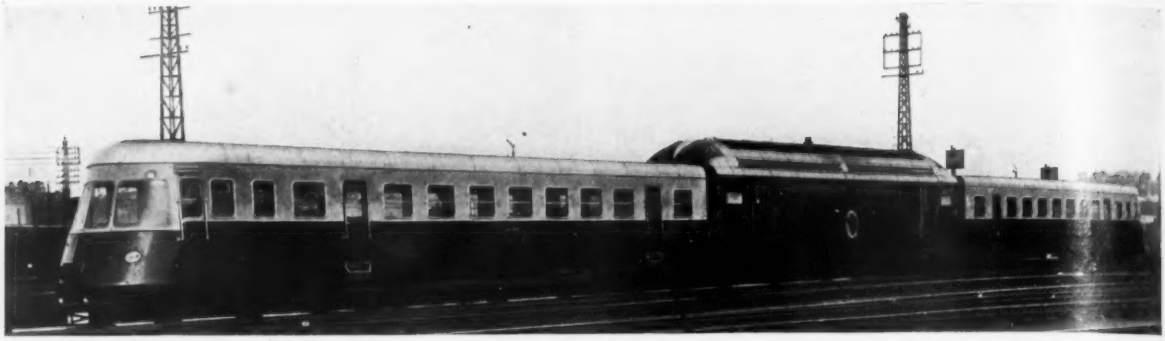
The remaining trains in France are the 820 b.h.p. sets of the Nord, the first two of which operate 61-68 m.p.h. schedules between Paris, Amiens, Lille and Tourcoing, a service which they have been performing since July, 1934 with an availability of about 90 per cent. They are unique among existing European diesel trains in that the cars are not articulated. The power and transmission units are almost duplicate with those of the *Flying Hamburger*. These sets have attained a top speed of 98·2 m.p.h. on test, but normally they have kept to the French legal maximum of 75 m.p.h. and perform their duties with a fuel consumption of 3·5 lb. per train-mile. Each train makes an average mileage of 64,000 a year. Eight further sets are now being delivered, and the last of these is to be powered by two supercharged Maybach engines with an output of 600 b.h.p. each. Some of these trains are to be coupled in multiple-unit and used on long distance suburban services out of Paris, the complete rake being divided at junctions, whence each set will go down a different branch. The top service speed allowed to these trains, and now also to the two original trains is 87 m.p.h. (140 km.p.h.).

One of the 1,200 b.h.p. three-car German trains leaving Berlin (Anhalter) on the Fliegende Münchener service

Belgium

Great strides have been made this summer in the application of streamlined diesel trains to fast interurban services in Belgium, where hitherto only one double-car 410 b.h.p. train has been in service. This original unit with one engine has been employed on 60·4 m.p.h. ser-

A Nord 820 b.h.p. three-car train near Paris



One of the new Renault 1,000 b.h.p. diesel-mechanical trains working on 70-72 m.p.h. schedules between Paris and Le Havre

vices between Brussels and Ghent since May, 1934, covering about 70,000 miles a year at an operating cost of 6½d. per mile, but the new trains have two engines; three of them have Maybach engines, two the Carels-Ganz make, one the Mercedes-Benz type, and two of Frichs manufacture, the power per train varying from 800 to 900 b.h.p. All the new trains are of the three-car type, seating 230 passengers on a weight of 120-138 tons and they are used on 54-61 m.p.h. services from the Belgian capital to such towns as Liége, Mons and Charleroi. In no case does the maximum speed in service exceed 75 m.p.h.

Denmark

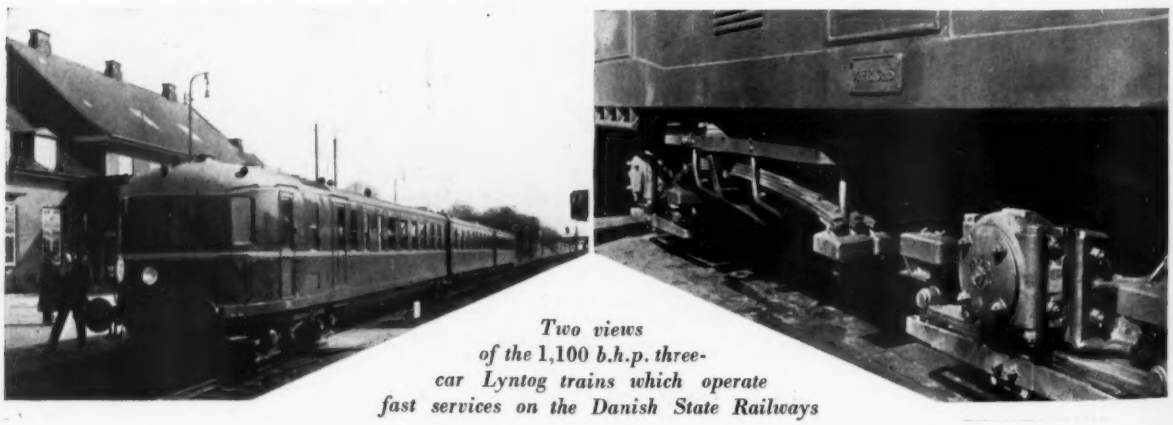
Although diesel traction began in Denmark as long ago as 1925, the services as a rule did not call for speeds higher than 50 to 55 m.p.h. and it was not until May, 1935 that set trains capable of high speeds were put into traffic. These trains are four in number, each consisting of three articulated cars powered by four 275 b.h.p. Frichs four-stroke engines, and almost immediately after they were put into service the Danes dubbed them *Lyntog*, or "Lightning Trains." They have four nose-suspended traction motors and the electrical control system is on the Asea system. They operate services at speeds of 55 to 63 m.p.h., start-to-stop between Copenhagen and Esbjerg, Aarhus and Aalborg. They weigh 118 tons tare and seat 36 first and 104 ordinary class passengers and have seats for 12 more in the dining saloon. A development of these trains is now under way in the form of an order for four rakes, each with four carriages and the same engine power.

Holland

Of all applications of the diesel engine to railway traction in Europe, none has received wider attention than that of the Netherlands Railways, first because of the magnitude of the application (40 three-car oil-electric trains straight off the reel) and secondly because of the unfortunate failures which occurred within two or three months of the inauguration. Of the 40 trains, 35 were powered by two Maybach 410 b.h.p. engines of the type used in the *Flying Hamburger* (some of them made under license by Werkspoor), and five by two 400 b.h.p. Stork-Ganz engines. All the mechanical portions were built by Dutch firms.

The troubles with the Maybach-engined trains were due to unsuitable characteristics of the electric transmission whereby the engines could be given an appreciable load at 800 r.p.m., that is, virtually at idling speed; unusual critical vibrations of the engines, which may have been accentuated by the mounting on the underframe, as similar trouble had not been experienced to any degree in the numerous German cars with bogie-mounted engines; and finally to lack of experience in maintenance, a trouble magnified because 35 trains were brought into service within five or six weeks, thus giving the staff no opportunity of becoming acclimatised to the new work by the running of one or two cars first. This trouble occurred in July and August, 1934, but from May, 1935, to February, 1936, after modifications, all the trains were reintroduced into the timetables on the Amsterdam-Utrecht-Eindhoven and Arnheim-Utrecht-Rotterdam sections, and make an aggregate monthly mileage of 108,000. The five Stork-Ganz trains were set to work in November, 1934, and have given but slight trouble.

These Dutch trains have three cars articulated together, the articulation bogies being of the six-wheeled type and each carrying two traction motors. Normally the speed does not exceed 62 m.p.h. but a velocity of 90 m.p.h. has been attained on trial. The bodies are of all-welded



Two views of the 1,100 b.h.p. three-car Lyntog trains which operate fast services on the Danish State Railways

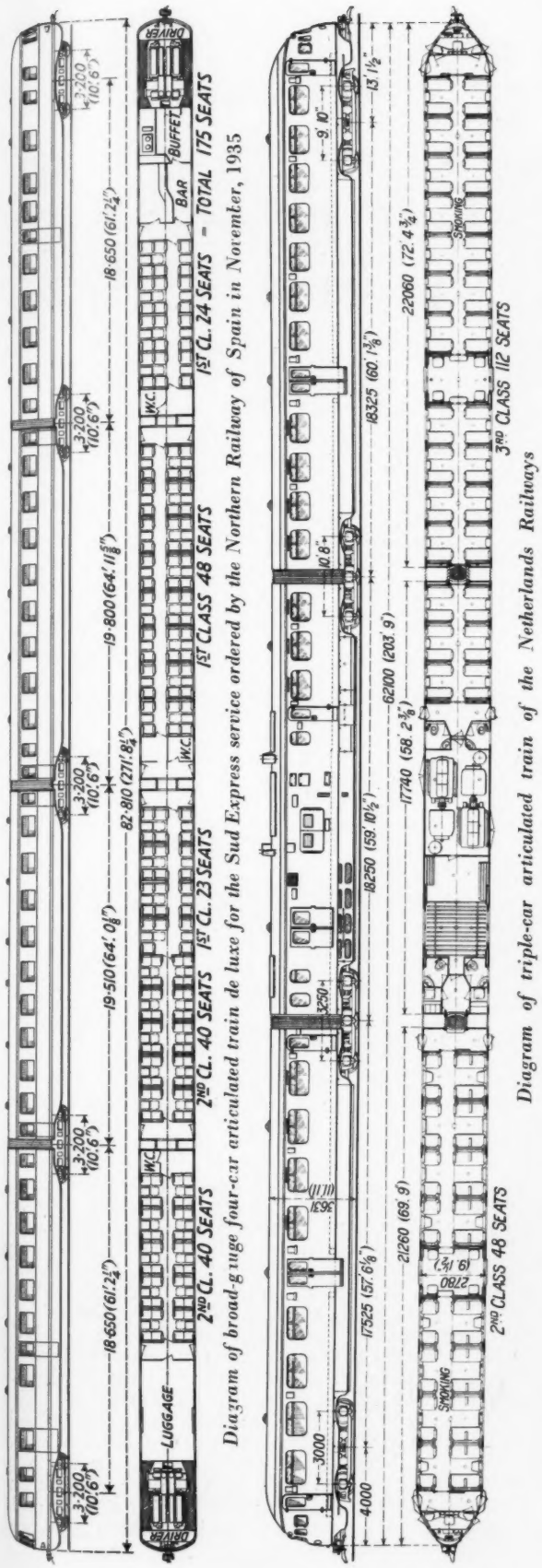


Diagram of broad-gauge four-car articulated train de luxe for the Sud Express service ordered by the Northern Railway of Spain in November, 1935

Diagram of triple-car articulated train of the Netherlands Railways

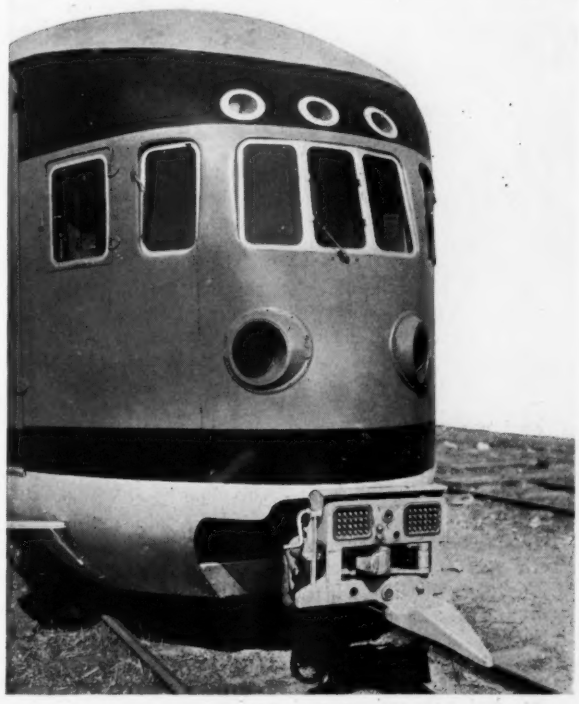
steel and this form of construction has been used for the bogies also. The tare weight is about 95 tons for a carrying capacity of 48 second and 112 third class, and multiple-unit control is incorporated so that two or more sets can be coupled together and driven by one man.

Italy

On October 15 the Italian State Railways are to begin mile-a-minute services with three-car diesel trains between Milan and Venice and Milan and Bologna. Nine trains are being built by Fiat and will be powered by two 400 b.h.p. Fiat engines. The transmission is to be mechanical, each engine transmitting its torque through a five-speed gearbox giving a maximum road speed of 100 m.p.h. Semi-de-luxe and buffet accommodation is to be provided in these all-steel trains. The front car will be given over almost entirely to the engine room, baggage compartment and kitchen, and will have ordinary ventilation, but the two passenger cars will be air-conditioned. Seating accommodation for 36 first and 42 second class passengers will be provided on a tare weight of about 85 tons.

Spain

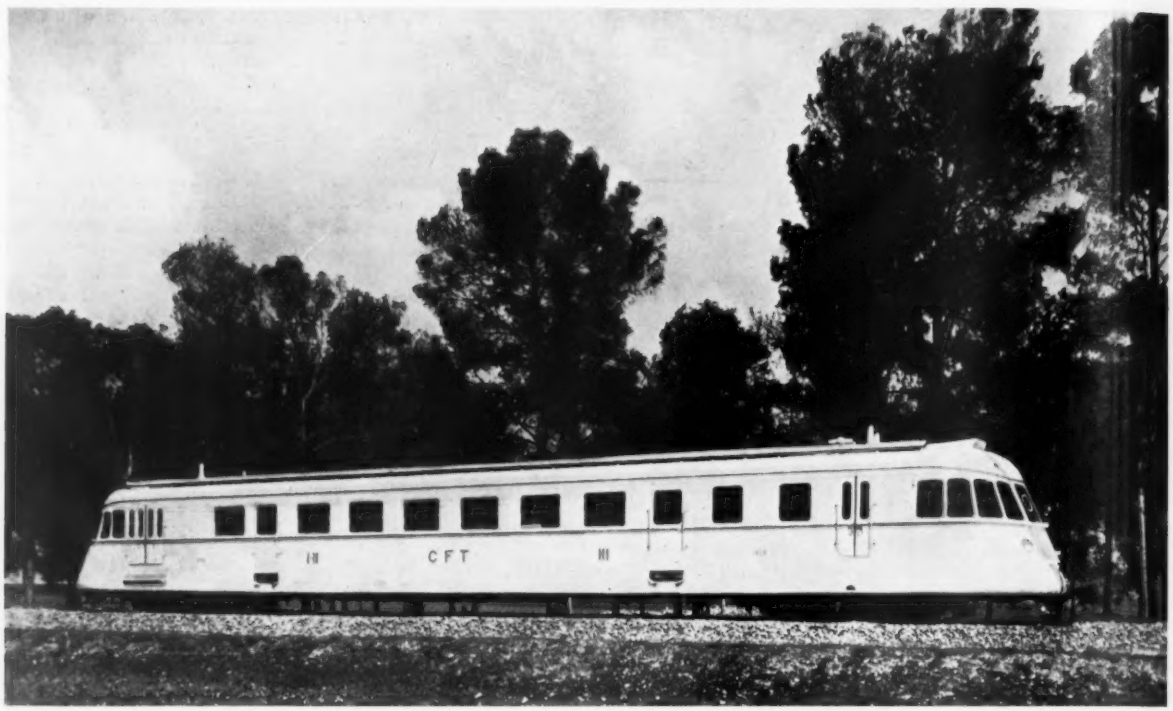
As yet no Spanish railway has in service anything bigger than 410 b.h.p. single-unit diesel cars, but at the end of last year the Northern Railway ordered six four-car streamlined trains, four with four Burmeister & Wain two-stoke engines aggregating 1,460 b.h.p. and two with four Frichs four-stroke engines totalling 1,100 b.h.p. Two of the Burmeister cars will operate on the Sud Express luxury service between Madrid and the French frontier. This is a mountainous and sharply curved route, and it is expected that the diesel trains, with their greater acceleration and lower centre of gravity, will be able to reduce the present time of 11 hr. 20 min. for the 395 miles to 8¼ or 8½ hr. The remaining trains are to be used between the Spanish capital and important towns.



End view of one of the Netherlands Railways oil-electric trains showing the Scharfenberg coupler

DIESEL CARS FOR NORTH AFRICA

Well-known French standard model modified for sub-tropical passenger service



One of the standard-gauge 265 b.h.p. railcars at work in the north of Tunis

TEN oil-engined railcars have been acquired recently by the Tunisian Railways in an endeavour to reduce the high operating costs of their system and at the same time give an accelerated service over the standard gauge lines in the north of the country. They operate a fast return service over the main trunk line between Tunis and Ghardimaou (on the Algerian frontier) and cover the 117 miles in 3 hr., at an average of 39 m.p.h. inclusive of 11 regular and 7 conditional stops. On the 61-mile route from Tunis to Bizerte the entire passenger traffic is operated by these railcars, with four return trips a day and extra services on Saturdays and Sundays. The time taken in each direction is 109 to 112 min. inclusive of 11 intermediate stops, but on the completion of certain realignment works the time is to be reduced to 80 min. and some of the stops cut out. Compared with the steam train service the railcars have effected a saving of 14 per cent. in time on the Ghardimaou line and 30 per cent. on the Bizerte route.

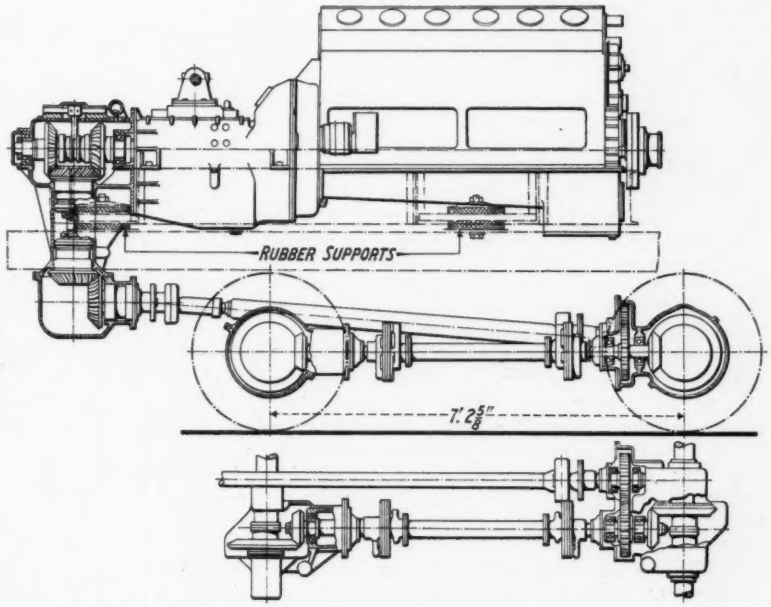
The design of the cars generally follows that of the standard 265 b.h.p. diesel-mechanical Renault car running on the French railways, but certain modifications have been made to suit the vehicles for operation in the North African climate and country. In particular, the adequate ventilation of the passenger saloons has been studied, and although air-conditioning has not been fitted, the insulating, sun-shading, and air-circulating arrangements are very complete. Heating of the car in the winter is carried out by means of the engine exhaust gases, but connections and equipment are provided for the pre-heating of the cars by steam, so that they will be warm before the first journey of the day is begun. Following normal Renault practice, the body is designed as a girder to take all the load, the framing being of steel sections and the panels of aluminium alloy, the whole body being welded up. Second and third class passengers are carried, the 20 of the former on seats upholstered in Pullman fashion and the 50 third class travellers on wooden seats. There is a driving compartment at each end and luggage and lavatory accommodation is included. No provision has been made for the haulage of trailers. The body is 83 ft. long and 9 ft. 6 in. wide.

The bogies have a wheelbase of 8 ft. 3 in. and are pitched at 55 ft. 6 in. centres; the steel side-frames are connected transversely by substantial cross stays at the ends and in the centre. The centre stretchers carry the body through pivots with rubber cushioning blocks, and lateral cushioning devices are fitted also. Special alloy steels have been used for the axles and the monobloc wheels, and the axles run in roller bearings. With supplies these railcars weigh 30 tonnes, and with a full complement of passengers and luggage about 39 tonnes. They have a maximum normal speed of 62 m.p.h., but it is planned eventually to replace the 265 b.h.p. engines by the latest Renault 300 b.h.p. engine which has been evolved since these cars were ordered; with the 300 b.h.p. engine, and when realignment works have been finished, it will be possible to run up to 75 m.p.h. Braking tests with both the air and electro-magnetic brakes in operation showed that the car could be stopped from 56 m.p.h. on the level in 600 ft. without

discomfort to passengers. The emergency braking distance was a good deal less.

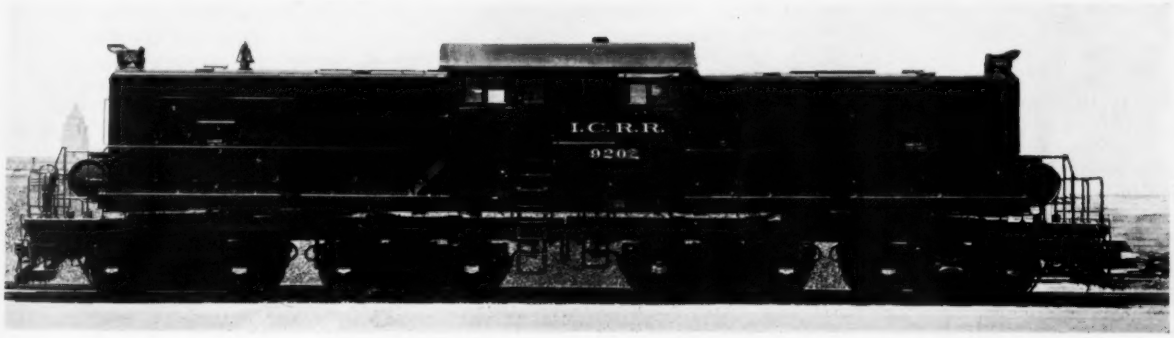
Both the power and transmission equipment are of the types standardised by Renault, the engine being of the 12-cylinder vee type running at 1,500 r.p.m. and the transmission consisting of a four-speed gearbox and main clutch directly attached to the engine on the car underframe and driving the axles through vertical bevels and cardan shafts. The two axles of the driving bogie are coupled by further cardan shafts and bevels, the arrangement being as shown in the diagram accompanying this article. The operation of the gearbox and clutch is controlled electro-pneumatically on a system which permits of multiple-unit control. An S.A.F. Traction cadmium-nickel battery provides the current for engine starting, electric braking, the control, signal circuits, and the car lighting.

Further railcars are now on order for the metre-gauge lines of the Tunisian Railways, and when delivered will be set to work on accelerated schedules over the coast line from Tunis southwards to Sousse and Sfax. It is planned to continue the journey of certain of these cars southward from Sfax as far as Gabes, running over the lines of the privately-owned Sfax-Gafsa line. The use of these cars will enable the journey from Tunis to such places as Gabes, Gafsa and Tozeur, in the far south of the country, to be made within one day.



Renault mechanical transmission as used on the railcars of the Tunisian Railways

The Third High-Power Freight Locomotive for Chicago



Winton-engined locomotive for high tractive effort duties

THE third of the high-power short-distance oil-electric freight locomotives ordered by the Illinois Central Railroad has been delivered, and is in operation between Chicago and Markham yard, a distance of about 20 miles. This locomotive differs from the two preceding units in that it has four four-wheeled bogies carrying eight nose-suspended traction motors, in place of two six-wheeled bogies with six traction motors. It has also a single driving cab in the centre in place of one at each end. Power is provided by two 12-cylinder two-stroke Winton engines, each of 900 b.h.p. and directly-coupled to generators with a maximum voltage of 750.

Extending over a length of 64 ft. 8½ in., this locomotive has a total wheelbase of 53 ft. and weighs in working order 143 Engl. tons. On the continuous rating the tractive effort at the wheel rims is 40,800 lb., and with a factor of adhesion of 3·3 the starting tractive effort is 96,000 lb. The complete electrical equipment was supplied by the American General Electric Company, and the locomotive itself was built by the St. Louis Car Company. The delivery of this locomotive completes a $1,600,000 diesel programme inaugurated by the Illinois Central at the end of 1934, and which comprised the construction of two 1,800 b.h.p. and one 2,000 b.h.p. freight transfer locomotives, eight 600 b.h.p. shunting locomotives, and one 1,200 b.h.p. five-car streamlined train named *Green Diamond*.

TOURIST RAILCAR.—The German State Railway has extended the glass roof construction to one of its 410 b.h.p. double-bogie oil-electric railcars which is being used as an observation car at tourist centres. A new feature is that a portion of the roof can be rolled back.

RAILCAR OPERATION IN THE SAAR

PRIOR to its incorporation in the Reichsbahn last year, the Saar Railways had purchased six small diesel cars, and these were briefly described in the issue of this Supplement for January 25, 1935. Although of generally similar design, four cars have two 55 b.h.p. Deutz engines and the remainder two 90 b.h.p. Deutz engines. All cars have Mylius gearboxes, but the vehicles operating over the Bliestal line have a gear ratio suitable for the top speed of 25 m.p.h. allowed over that route, whereas the other cars are allowed a top speed of 40 m.p.h. All cars are of the four-wheeled type with engines in bonnets at each end.

Natural draught cooling was used at first, but some difficulty was encountered in keeping the rear engine cooling water temperature within desirable limits. Belt-driven fans were therefore installed, and have solved the problem. Nickel-cadmium batteries already in use on the Saar Railways were notable for their insensitivity to high discharge rates, but following complaints by certain automobile firms, another battery with a very low internal resistance was evolved by the S.A.F. et Traction, and this was fitted to the diesel cars. As the cars are used over certain routes having numerous level crossings without gates, considerable attention was given to the braking. The Perrot compressed air brakes operate on drums inside the wheels, and on the level can stop a fully laden car weighing about 16 tons from 25 m.p.h. in 90 ft. When these brakes are fully applied, the compressed air sanding gear comes into operation automatically and gives a greater coefficient of friction between the wheel and the rail. Dead-man handle apparatus is incorporated in the braking and mechanical transmission controls.

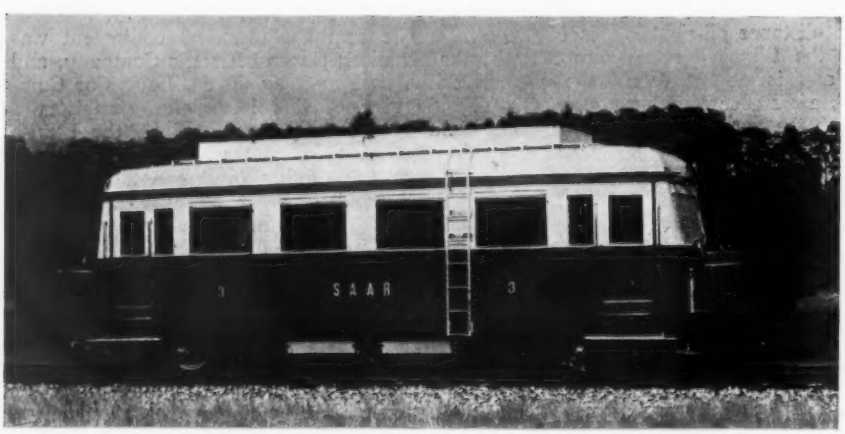
Another special provision necessitated by the type of line worked over is the fitting of two compressed air Typhon horns, one with a high pitch and one with low, but both being audible over relatively long distance and quite different in tone from those of automobiles. These horns are operated through an automatic device which gives notes from the two hooters alternately, with a short pause between each blast. An air-operated warning bell also is fitted for use in certain towns and villages.

In view of the secondary character of the lines, particular study was made of the suppression of vibration. The wheels have rubber inserts which reduce both noise and vibration, auxiliary rubber springs are fitted to the laminated axlebox springs, and the oil engine is mounted on rubber blocks. The car bodies are of all-steel construction and the sides and floor have a lining of Celotex. The mechanical portions were built by the Waggonfabrik Wismar.

Map of the lines of the Saar Railways (now the Saar Direktion of the Reichsbahn) with diesel services

These oil-engined cars are being operated over the Bierbach-Reinheim (Bliestal), Bierbach-Homburg, Bierbach-Zweibrucken, and Schwarzenacher-Einöd lines, and also make one trip a day between Rohrbach and Glan-Münchweiler. When all the diesel cars are in service the daily mileage is 1,345, but two small petrol cars are held as reserve units. Over the Bliestal line all the passenger traffic, amounting to 24 trains a day in each direction and 37 trains a day over part of the line, is in the hands of the railcars. As the goods trains are fairly frequent some trouble was experienced in getting a satisfactory timetable, for steam trains are subject to a maximum allowable speed of 15 m.p.h., whereas the railcars consistently run up to their maximum of 25 m.p.h. Two of the cars are arranged so that they can be converted within a few minutes for use as parcels and light goods vehicles, and over the Bliestal line a dozen of these trips are made each day.

The average monthly mileage per railcar is 5,300, a



One of the double-engined diesel cars with Deutz engines as running on the Saar lines. The livery is that of the Saar Railways before that organisation was merged in the German State Railway

distance which is limited to some extent by the low speed permitted over the Bliestal branch. The cost of the diesel cars with the two 90 b.h.p. Deutz engines was 222,000 fr. (£2,970 fr. at the current rate and £1,800 at par), and for the cars with two 55 b.h.p. engines, 144,000 fr. (£1,920 at the current rate and only £1,160 at par).

Comparative running costs for the oil-engined cars and steam trains and electric battery railcars operating over the same routes are given in the following table.

OPERATING COSTS OF DIFFERENT TRAIN TYPES, SAAR RAILWAYS

	Diesel Cars	Light Steam Trains	Battery Railcars
	Fr. per month	Fr. per month	Fr. per month
Interest charges	833	No allowance, as all units in use are very old.	
Depreciation	1,250		
Repairs and maintenance	1,277	3,800	12,656
Fuel	2,983	13,317	4,862
Lubricating oil, water, &c.	189	831	860
Wages (2 men)	13,533 (2 men)	22,496 (3 men)	12,975 (2 men)
Total monthly cost	20,085	40,444	31,353
Gross operating cost per train-km.	2·36	4·76	3·69
		Not including interest or depreciation.	

The diesel cars operating on the lines other than the Bliestal branch show gross operating costs of 2·1 fr. per train-km. by reason of the higher mileage (up to 205 a day) which they make, due partly to their top speed of 40 m.p.h. compared with 25 m.p.h. The fuel consumption of all the diesel cars averages 25 litres per 100 km. (about 0·76 lb. per mile).

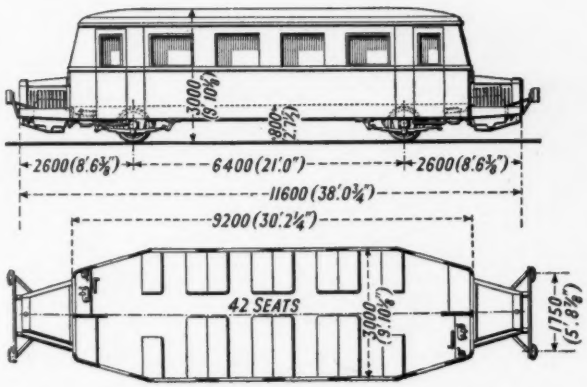
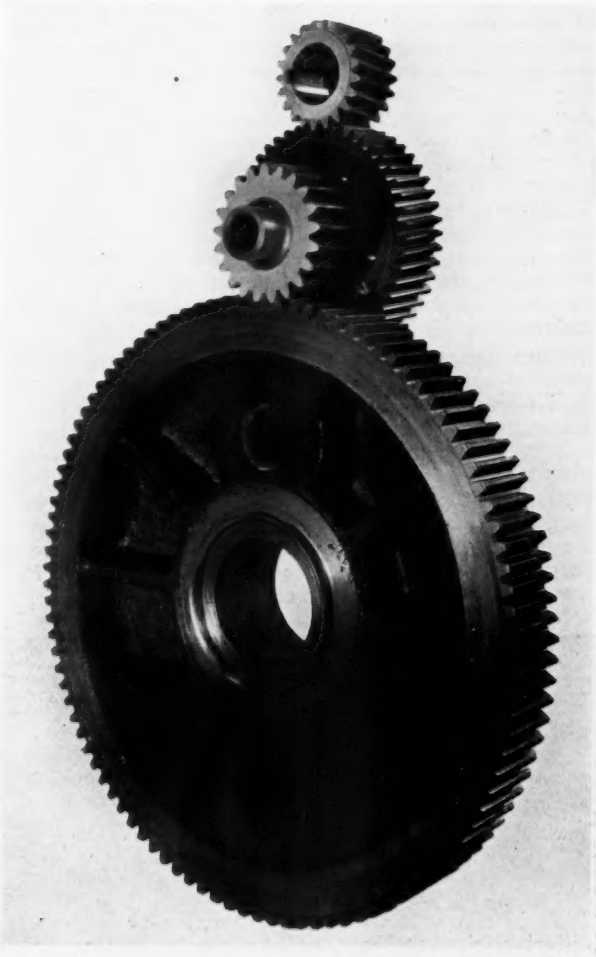


Diagram of the 110 b.h.p. Saar railcars. They have Deutz engines, Mylius transmission, and Fischer roller bearings

Transmission Gearing

THE double-reduction gear of the Armstrong-Whitworth 350 b.h.p. oil-electric shunting locomotives is shown in the illustration in the next column. The locomotives themselves were fully described in the issue of this Supplement for March 20. Made by Alfred Wiseman & Co. Ltd., this gearing consists of a pinion with 21 teeth, 2½ D.P., a 5¾-in. face, and 7½ deg. helical, which is fitted to the end of the motor shaft. This meshes with a sleeved wheel having 48 teeth, to which is fixed a further pinion with 21 teeth, 2 D.P., 6½-in. face, and straight teeth, which meshes with the final wheel, which has 102 teeth. This wheel is a toothed rim shrunk on to the jackshaft disc and turned and cut in position. The material is chrome-manganese steel, hardened and tempered to a Brinell number of 340-360, and cut after hardening. The roller bearings for the intermediate shaft were shrunk on to the end of the sleeved wheel, and the outside of the bearing was housed in the main casting of the gear case.



Double-reduction gear for L.M.S.R. diesel locomotive

HUNSLET DIESELS.—An interesting variety of diesel-mechanical locomotives is illustrated in a brochure just issued by the Hunslet Engine Co. Ltd., of Jack Lane, Leeds. The selection includes the locomotives built for the L.M.S.R. and Woolwich Arsenal; a locomotive for passenger and freight service on the Egyptian Delta Light Railways; and several units for operation in the tropical climates of Iraq, the Sinai peninsula, and West Africa. The fruits of much practical running experience is embodied in the Hunslet designs, and the firm has built locomotives with over a dozen different engine types and as many transmission varieties. Interesting facts culled from this brochure are that the 150/180 b.h.p. shunting locomotives supplied to the L.M.S.R. save about £20 a week compared with the previous steam locomotives; they use about 30 gal. of fuel per 24 hr. shift. A similar locomotive operating over barren country where water is at a premium is saving £40 a week.

NOTES AND NEWS

Night Travel in New Zealand.—The New Zealand Government Railways have been testing out their new 95 b.h.p. diesel-hydraulic railcar for the conveyance by night of passengers and newspapers between Christchurch and Greymouth, for which purpose it was specially designed. It has an overall length of 25 ft. and a wheelbase of 14 ft. 6 in. It weighs 7 tons 8 cwt., and can accommodate a score of passengers. The newspapers are carried in a special compartment. The engine and transmission unit, shown in the illustration at the foot of this page, was supplied by Leyland Motors Limited.

Spanish Railcar Trials.—In the course of tests at the end of June with one of the 265 b.h.p. Renault cars of the M.Z.A., illustrated and described on p. 86 of the July 10 issue of this Supplement, the 426 miles from Madrid to Barcelona were covered in 8 hr. 25 min., including a 2 min. stop at Saragossa; the running average was 51 m.p.h. Over the 852-mile return trip the fuel consumption averaged 9·86 gr. per tonne-km. (0·0355 lb. per ton-mile) and the lubricating oil consumption 5·7 gr. per car-km. (0·0206 lb. per car-mile). Acceleration readings were from rest to 35 km. p.h. (21·7 m.p.h.) in 40 sec.; to 60 km. p.h. (37·3 m.p.h.) in 75 sec.; and to 95 km. p.h. (59 m.p.h.) in 178 sec., the car itself weighing 35 tonnes as loaded.

Diesel Railcars for South America.—Orders for 10 articulated diesel railcars, each to be fitted with two Gardner 6LW engines developing 102 b.h.p. at 1,700 r.p.m., have been placed with the Birmingham Railway Carriage & Wagon Co. Ltd., by the Buenos Ayres Midland Railway. The cars are not all to be of the same type. Four will be one-class, for local service; four two-class, for main line work; and the remaining two for general goods and poultry service. Each vehicle will be fitted with a Vulcan-Sinclair coupling and Wilson epicyclic four-speed and reverse gearbox. All cars will have vacuum brakes, and those for main-line running will be provided with buffet sections, electrical cooking equipment and refrigerators. With the exception of the two goods vehicles, lavatory accommodation will be provided throughout.

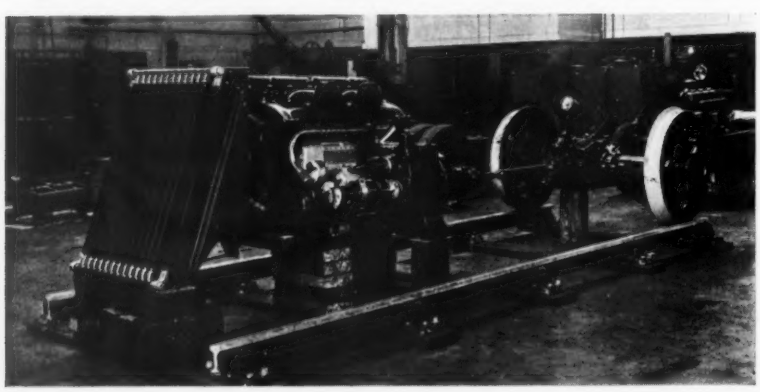
Büchi Superchargers.—Since the publication of the August 7 issue of this Supplement the Büchi Syndicate has informed us that prior to the delivery of the three Homecourt oil-electric locomotives to the Congo-Ocean Railway, which units we credited in an editorial with being the only locomotive applications of turbo-charging within recent months, they had supplied Büchi superchargers for diesel locomotives in the U.S.S.R. About five years ago the Büchi Syndicate supplied their superchargers to the Rauschenbach Company, of Schaffhausen, for incorporation in engines they were building for the U.S.S.R. under licence from the M.A.N., and four similar engines have been built since in Soviet works. In each case the normal supercharged output was 1,500 b.h.p., and the turbo-blowers themselves were built by Brown Boveri.

Jugoslav Railcar Extension.—Following extensive trials with the six diesel cars described in the issue of this Supplement for May 15, the Jugoslav State Railways propose to inaugurate a diesel service in 1937 over the metre-gauge Belgrade–Sarajevo–Dubrovnik line with new cars to be built in Germany. Originally it was proposed to begin a service this year. By the use of these new cars it is hoped to reduce the overall journey time by 33 per cent. to 16 hours.

Brazilian Diesel Train.—After gaining a good deal of experience with the broad-gauge 450 b.h.p. oil-electric train, *Cometa*, built by Sir W. G. Armstrong-Whitworth & Co. (Engineers) Ltd., the San Paulo Railway has placed with the same builder an order for two enlarged trains, each consisting of four close-coupled vehicles and powered by a 600 b.h.p. Armstrong-Sulzer engine, compared with the three-car articulated construction of *Cometa*. The 600 b.h.p. engine is to be virtually the same in mechanical construction as the 450 b.h.p. unit of *Cometa*, but it is to be fitted with a Büchi supercharger which will increase the normal output by 33 per cent. Three English Electric traction motors will be distributed down the train. The seating capacity of the train will be 134 and buffet accommodation will be provided. The passenger coaches will be built for Armstrong-Whitworth by the Birmingham Railway Carriage & Wagon Co. Ltd.

Minerva Gearboxes.—Applications of the Minerva gearbox, illustrated and described in the issue of this Supplement for May 15, are being made to nine double-bogie 150 b.h.p. diesel railcars for the Corsican Railways (which system already has six cars with Minerva boxes); to three 270 b.h.p. double-bogie cars for the Ivory Coast Railways which are to be used on night passenger service between Abidjan and Bobo-Dioulasso; and to 11 double bogie railcars of 85 and 135 b.h.p. for various French local lines.

Diesel Car Excursion.—On Sunday, June 28, an excursion was run from Taunton to Newquay by a Great Western diesel railcar specially hired by a party. One of the Bristol cars was used and run light to Taunton. The journey from Taunton to Newquay (calling at Plymouth North Road to change drivers and at Luxulyan to cross an up train) was completed in four hours, the 82·8 miles from Taunton to North Road being scheduled in 113 min. On the return journey, owing to the heavy occupation of the line with excursions, the throughout journey occupied 4 hr. 20 min., with stops at St. Columb Road (for crossing purposes) and North Road (for locomotive purposes). On arrival at Taunton the car was returned light to Bristol.



Left: Leyland power-transmission set as supplied to the New Zealand Government Railways for incorporation in a railcar